

WO 2005/017148

PCT/US2003/041600

ggtgatacttctacaatcagaagtcaagggcaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtggtgtactatagtaactcttactgggtactcagatgtctggggcac
agggaccacggtcaccgtctcttctgatcaatccaactctgaagaagcaaagaaaggaggagccaaaaaggaggaagccaaga
aatctaacagcgtcgacattgttctgactcagctccagccaccctgtctgtgactccaggagatagagtctcttctcctgcaggggcc
5 agccagagtattagcgactacttacactgggtatcaacaaaaatcacatgagcttccaaggcttctcatcaaatatgcttccattccatc
tctgggatccctccagggtcagtggtcagtggtcaggggtcagatttactctcagtatcaacagtgtggaacctgaagatgttgaa
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caggatctcctgcaaggcttctgggtatgccttcacaactactggaatgcagtggtgcaagagatgccaggaaagggttgagt
10 ggattggctggataaacaccccactctggagtgccaaaatatgtagaagacttcaaggacggttgccttctcttggaaacctctgc
caacactgcatatttacagataagcaacctcaagatgaggacacgggtactgtatttctgtgtgagatccgggaatgtaactatga
cctggcctactttgcttactggggccaaggacactggtcactgtctctgatcaggagcccaaatctctgacaaaactcacacatcc
ccaccgtccccagcacctgaactcctgggggagtcagttctcttctcccccaaaacccaaggacacctcatgatctcccg
gacccctgaggtcacatgcgtggtggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtgga
15 ggtgcataatgccaagacaaagccgcgggaggagcagtlacaacagcacgtaccgtgtggtcagcgtctcaccgtcctgcacca
ggactggctgaatggcaaggagtacaagtgaaggcttccaacaaagccctccagccccatcgagaaaacaatctccaaagc
caaagggcagccccgagaaccacaggtgtacacctgccccatcccggtgagctgaccaagaaccaggtcagcctgacct
gcctggtcaaaggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacg
cctcccggtgctggactccgacggctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcagggggaacgtct
20 tctcatgctccgtgatgcatgaggtctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatclaga

2H7-antiCD40 scFv MTH (SSS) MTCH2WTCH3 (2H7-40.2.220Ig) (amino acid sequence) (SEQ ID NO: __)

MDFQVQIFSFLLISASVIIARGQIVLSQSPAILSPGGEKVTMTCRASSSVSYMHWY
25 QQKPGSSPKPWYIAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKGGGGSGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYSNSYWFYFDVWGTGTTVTVSSDQSNSEEAK
KEEAKKEEAKSNSVDIVLTQSPATLSVTPGDRVSLSCRASQSISDYLHWYQQKSH
30 ESPRLLIKYASHSISGIPSRFSGSGSGSDFTLINSVEPEDVGIYYCQHHGHSFPWTFGG
GTKLEIKRGGGGSGGGSGGGGSIQLVQSGPELKKPGETVRISCKASGYAFTTTG
MQWVQEMPVKGLKWIGWINTPLWSAKICRRLQGRFAFSLETSANTAYLQISNLKD

WO 2005/017148

PCT/US2003/041600

EDTATYFCVRSNGNYDLAYFAYWGQGLVTVSDQEPKSSDKTHTSPSPAPPELL
GGSSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTK
PREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPRE
PQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPVLDS
5 GSFFLYSKLTVDKSRWQQGNVFCFVMSHEALHNHYTQKSLSLSPGK

5B9 VH (includes the VH leader peptide) (nucleotide sequence) (SEQ ID NO: __)

atggctgtcttggggctgctcttgcctggtagacattccaagctgtgcctatcccaggtgcagctgaagcagtcaggacctggcc
tagtgacgtcctcacagagcctgtccatcacctgcacagctctgtgttctcattaactacctatgtgtacactgggttcgccagtc
10 caggaaagggctctggagtggtggagtgatggagtggtggaatcacagactataatgcagcttccatccagactgagcatc
accaaggacgattccaagagccaagtttctttaaataaacagctgcacacctaataacacagccatttattactgtgccagaaatg
ggggtgataactacccttattactatgctatggactactgggggtcaaggaacctcagtcaccgtctcctca

5B9 VH (minus the leader) (nucleotide sequence) (SEQ ID NO: __)

cagggtgcagctgaagcagtcaggacctggcctagtgacgtcctcacagagcctgtccatcacctgcacagctctgtgttctcatta
actacctatgtgtacactgggttcgccagtcctcaggaaagggctctggagtggtgggtggagtgatggagtggtggaatcacaga
ctataatgcagcttccatccagactgagcatcaccaaggacgattccaagagccaagtttctttaaataaacagctgcacaccta
atgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatggactactggggicaaggaacctca
gtcaccgtctcctca

5B9 VH (includes leader peptide) (amino acid sequence) (SEQ ID NO: __)

MAVLGLLFCLVTFPSCVLSQVQLKQSGPGLVQSSQSLSTCTVSGFSLTTYAVHWV
RQSPGKGLEWLGVIWSSGITDYNAAFISRLSITKDDSKSQVFFKMNSLQPNDAIY
YCARNGGDNYPYYYAMDYWGQGSVTVSS

5B9 VH (no leader peptide) (amino acid sequence) (SEQ ID NO: __)

QVQLKQSGPGLVQSSQSLSTCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSSGI
TDYNAAFISRLSITKDDSKSQVFFKMNSLQPNDAIYYCARNGGDNYPYYYAMDY
WGQGSVTVSS

WO 2005/017148

PCT/US2003/041600

5B9 VL (nucleotide sequence) (SEQ ID NO: __)

atgaggttctctgctcagcttctggggctgcttgtgctctggatccctggatccactgcagatattgtgatgacgaggctgcattctc
caatccagtcactcttggaaatcagcttccatctctcaggtctagtaagagtctcctacatagtaatggcatcactatttgattgg
tatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaacctgcctcaggagtcccagacaggttcagtagca
5 gtgggtcaggaactgatttcacactgagaatcagcagagtggaggctgaggatgtgggtgtttattactgtgctcaaatctagaact
tccgctcacgttcggtgctgggaccaagctggagctgaaacgg

5B9 VL (amino acid sequence) (SEQ ID NO: __)

MRFSAQLLGLLVLWIPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHLSNGITY
10 LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKR

5B9 scFv (nucleotide sequence) (SEQ ID NO: __)

aagcttccgccatgaggttctctgctcagcttctggggctgcttgtgctctggatccctggatccactgcagatattgtgatgacgca
15 ggctgcatttccaatccagtcactcttggaaatcagcttccatctctcaggtctagtaagagtcctacatagtaatggcatca
cttatttgattggtatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaacctgcctcaggagtcccagaca
ggttcagtagcagtggggtcaggaactgatttcacactgagaatcagcagagtggaggctgaggatgtgggtgtttattactgtgctc
aaaatctagaacttccgctcacgttcggtgctgggaccaagctggagctgaaacggggtggcgtggctcgggcgggtgggtgggt
cgggtggcggcgatcgtcacaggtgcagctgaagcagtcaggacctggcctagtgcagtcctcacagacctgtccatcacct
20 gcacagtctctggtttctattaactacatgctgtacactgggttcgccagtctccaggaaagggtctggagtggctgggagtgat
atggagtgtggaatcacagactataatgcagctttcatatccagactgagcatcaccagacgattccaagaccaagttttctt
aaaatgaacagtctgcaacctaatgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
ctactggggtcaaggaacctcagtcaccgtctcctct

25 5B9 scFv (amino acid sequence) (SEQ ID NO: __)

MRFSAQLLGLLVLWIPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHLSNGITY
LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGSGGGSGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVWSGITDYNAAFISRLSITKDDSK
30 SQVFFKMNSLQPNDAIYYCARNGDNYPYYAMDYWGQGTSVTVSS

WO 2005/017148

PCT/US2003/041600

5B9 scFv-hmflgG1-hCD80 (nucleotide sequence) (SEQ ID NO: __)

aagcttcccgcacatgaggttctctgctcagcttctggggctgcttgtgctctggatccctggatccactgcagatattgtgatgacgca
ggctgcattctccaatccagtcactcttgaacatcagcttccatctcctgcaggctagtaagagtctcctacatagtaaatggcatca
5 cttatttgatttggtatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaaccttgcctcaggagtcccagaca
ggttcagtagcagtgggtcaggaactgatttcacactgagaatcagcagagtgagggtgaggatgtgggtgtttattactgtgctc
aaaatctagaacttccgctcacgttcgggtgctgggaccaagctggagctgaaacgggggtggcgggtggctcgggcgggtgggtgggt
cgggtggcggcgatgctcacagggtgcagctgaagcagtcaggacctggcctagtgcagtcctcacagagcctgtccatcacct
gcacagctctggtttctcattaactacctatgctgtacactgggttcgccagctctccaggaaagggtctggagtggctgggagtgat
10 atggagtgggtggaatcacagactataatgcagcttccatccagactgagcatcaccaaggacgattccaagagccaagtttcttt
aaaatgaacagtctgcaacctaatgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
ctactgggtgcaaggaacctcagtcaccgtctcctctgatctggagcccaaatctctgacaaaactcacacaagcccaccgagcc
cagcacctgaactcctggggggatgctcagctctcctctccccccaaaacccaaggacacctcatgatctcccgaccctcctgag
gtcacatgcgtggtgggtggacgtgagccacgaagacctgaggtcaagtccaactggtacgtggacggcgtggaggtgcataat
15 gccaaagacaaagccgcgggaggagcagtlacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggct
gaatggcaaggagtlacaagtgaaggtctccaacaaagccctcccagccccatcgagaaaaccatctccaaagccaaagggc
agccccgagaaccacagggtgtacacctgccccalcccgggatgagctgaccaagaaccaggtcagcctgacctgctctggtca
aaggcttctatccagcgacatcggcgtggagtgggagagcaatgggcagccgggagaacaactacaagaccacgcctcccgtg
ctggactccgacggctccttctcctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctc
20 cgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaagcggatccttgaacctgctcc
catcctgggccattaccttaatctcagtaaatggaatttttgatgatgctgcctgacctactgctttgccccaaagatgcagagagaga
aggagggaatgagagattgagaagggaagtgtacgcctgtataaatcgatactcgag

5B9 scFv-hmflgG1-hCD80 (amino acid sequence) (SEQ ID NO: __)

MRFSAQLLGLLVLWIPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHNSNGITY
LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGSGGGSGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVWSSGGITDYNAAFISRLSITKDDSK
SQVFFKMNSLQPNDAIYYCARNGGDNYPPYYAMDYWGQGTSTVTVSSDLEPKSS
30 DKTHTSPPSPAPPELLGGSSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFNW
YVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPA
PIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQP

WO 2005/017148

PCT/US2003/041600

ENNYKTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSVMSHEALHNHYTQKSLS
LSPGKADPSNLLPSWAITLISVNGIFVICCLTYCFAPRCRERRRNERLRRESVRPV

2e12 scFv WTH CH2 CH3 (2e12 scFv-WthIgG-CD80) (nucleotide sequence) (SEQ

5 ID NO: __)

aagcttatggattttcaagtcagattttcagcttctgctaatacagtgcttcagtcataatgtccagaggagtcgacattgtgctcacc
aatctccagcttcttggctgtgtctctaggtcagagagccaccatctctgcagagccagtgaaggtgtgaatattatgcacaagtt
taatgcagtggtaccaacagaaaccaggacagccacccaaactcctcatctctgctgcacccaacgtagaatctggggtccctgcc
aggtttagtggtcagtggtgtggacagacttcagcctcaacatccatcctgtggaggaggatgataatgcaatgtatttctgtcagc
10 aaagtaggaaggttcttggacgttcggtggaggcaccagctggaaatcaaacggggtggcgggtggtcggcgagggtggg
tcgggtggcggcgatctcaggtgcagctgaaggagtcaggacctggcctggtggcgccctcacagagcctgtccatcacatgc
accgtctcagggttctcalttaaccggctatggtgtaaactgggttcgccagcctccaggaaagggtctggagtggctgggaatgat
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aaaaatgaacagctctgcaaactgatgacacagccagataclactgtgccagagatggttatagtaactttcattactatgttatggact
15 actggggtcaaggaaacctcagtcaccgtctcctcagatctggagcccaaatcttgcacaaaactcacacatgccaccgtgccca
gcacctgaactccttggggggaccgtcagcttctcttcccccaaaacccaaaggacacctcatgatctccggacctctgaggt
cacatgcgtggtggtggacgtgagccacgaagacctgaggtcaagtcaactggtacgtggacggcgtggaggtgcataatgc
caagacaaagccggggaggagcagtagaacagcagctaccgtgtggtcagcgtcctcaccgtctgcaccaggactggctga
atggcaaggagtacaagtcaaggctccaacaagccctccagcccccacgagaaaacctctccaaagccaaagggcag
20 ccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgtgcaaa
ggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaaactacaagaccacgcctccctgct
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gtgatgcatgaggtctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaacggatccttgaacctgctccc
atcctgggccattacctaattctcagtaaatggaattttgtgatagctgcctgacctactgctttgccccaaagatgcagagagagaa
25 ggaggaatgagagattgagaagggaaggtgtacgcctgtataaatcgat

2e12 scFv WTH CH2 CH3 (2e12 scFv-WthIgG-CD80) (amino acid sequence) (SEQ
ID NO: __)

MDFQVQIFSFLLISASVIMSRGVDIVLTQSPASLAVSLGQRATISCRASESVEYYVTS
30 LMQWYQQKPGQPPKLLISAASNVESGVPARFSGSGSGTDFSLNIHPVEEDDIAMYF
CQQSRKVPWTFGGGTKLEIKRGGGGSGGGSGGGGSQVQLKESGPGLVAPSQSLS
ITCTVSGFSLTGYGVNWVRQPPGKGLEWLGMIWGDGSTDYNSALKSRLSITKDNS

WO 2005/017148

PCT/US2003/041600

KSQVFLKMNSLQTDDTARYYCARGYSNFHYVMDYWGQGSVTVSSDLEPKS
CDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFN
WYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALP
APIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQ
5 PENNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFSQVMHEALHNHYTQKSL
SLSPGKADPSNLLPSWATLISVNGIFVICCLTYCFAPRCRERRRNERLRRESVRPV

2H7-human IgE Fc (CH2-CH3-CH4) (nucleotide sequence) (SEQ ID NO: __)

aagcttccgccatggatttcaagtcagatttcagcttctgctaatacagtcgttcagtcataattgccagaggacaaattgttctct
10 cccagctccagcaatcctgtctgcattccaggaggagaaggtcacatgactgcagggccagctcaagtgaattacatgcact
ggtagcagcagaagccaggatcctccccaaacctggatttatccccatccaacctggcttctggagtcctctgctcgttcagtg
gcagtggtgtctgggaccttactctctcacaatcagcagagtgaggagctgaagatgctgccacttattactgccagcagtgagggtt
taaccacccacgttcggtgctgggaccaagctggagctgaaagggtggcggctggcggcgggtggatctggaggaggtg
ggagctctcaggcttatctacagcagctggggctgagctggtgaggcctggggcctcagtgagatgctctgcaaggcttctggc
15 tacacatttaccagttacaatatgcactgggttaaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
ggtgatacttctacaaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctattctgtgcaagagtggtgtactatagtaacttactggtagcttcgatgtctggggcac
agggaccacggtcaccgtctctgatcacgtctgctccagggaattcaccccgccaccgtgaagatcttacagtcgtctctgcgacg
gcggcgggcaacttcccccgacctccagctcctgtgctctgctctgggtacacccagggaactatcaacatcacctggctgga
20 ggacgggcaggtcatggacgtggactgtccaccgcctctaccacgcagggaggtgagctggcctccacacaaagcagctca
ccctcagccagaagcactggctgtcagaccgcactacacctgccaggtcacctatcaaggtcacaccttggaggacagcaccac
gaagtgtcagattccaacccgagaggggtgagcgctacctaagccggccagcccgttcgacctgttcacccaagtgcgc
cacgatcacctgtctggtggtggacctggcaccagcaaggggaccgtgaacctgacctggctccgggaccagtggaagcctgt
gaaccactccaccagaaaggaggagaagcagcgcaatggcacgttaacctgcacgtccaccctgccggtgggcacccgagact
25 ggatcaggggggagacctaccagtgagggtgacccacccccacctgccaggggcctcatgggtccacgaccaagaccag
cgcccgctgctgctcccggaagtctatgcgtttgcgacggcgagtgccgggggagccgggacaagcgacacctgcctgc
ctgatccagaactcatgcctgaggacatctcgttgagtgagtgacacagaggtgcagctcccgagcggccggcacagcagc
acgcagccccgaagaccaagggtccgcttctcgtctcagccgctggaggtgaccagggccgaatgggagcagaaaga
tgagttcatctgccgtgcagtcctatgaggcagcgagccctcacagaccgtccagcgagcggtgtctgtaaatcccgtaaatgat
30 aatctaga

WO 2005/017148

PCT/US2003/041600

2H7 scFv IgE (CH2-CH3-CH4) (amino acid sequence) (SEQ ID NO: __)

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 FNPPTFGAGTKLELKGGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
 5 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
 TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSDHVCSDFTP
 PTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTASTTQE
 GELASTQSELTLSQKHWLSDRITYTCQVTYQGHTEFEDSTKKCADSNPRGVSAAYLSR
 PSPFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNGTLTV
 10 TSTLPVGTTRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATPEWP
 GSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKGSGFFVFSRLE
 VTRAEWEQKDEFICRAVHEAASPSQTVQRAVSVNPGK

2H7 scFv MH (SSS) MCH2WTCH3 (nucleotide sequence) (SEQ ID NO: __)

15 aagcttgcegccatggatttcaagtcagatttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
 ccagctccagcaatctgtctgcatctccaggggagaaggtaacaatgactgcagggccagctcaagttaagtacatgcact
 ggtaccagcagaagccaggatcctccccaaccctggatttatgcccacccaacctggcttcggagtcctgctcgttcagtg
 gcagtggtgctgggacctcttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgaggatt
 taacccaccacgttcggtgctgggaccaagctggagctgaaagatggcgggtgctcggcggtggtggatctggaggaggtg
 20 ggagctctcaggcttatctacagcagctctggggctgagctggtgagcctggggcctcagtgaaatgctctgcaaggctctggc
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 ggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
 cagcctgacatctgaagactctgcggtctatttctgtgcaagagtggtgtactatagtaactcttactggtacttcgatgctcggggcac
 agggaccacggtcaccgtctctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtccccagcacctgaac
 25 tcttgggggatcgtcagcttctcttcccccaaaaccaaggacacctcatgatctccggaccctgaggtcacatgcgtg
 gtggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgccaagacaaag
 ccgcgggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaagga
 gtacaagtcaaggctccaacaaagccctccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaac
 cacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaaggcttctatcc
 30 cagcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgcctcccgctgctggactccgac
 ggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatga
 ggctctgcacaaccactacacgcagaagagcctctccctgtctccggtaaatgatctaga

WO 2005/017148

PCT/US2003/041600

2H7 scFv MH (SSS) MCH2WTCH3 (amino acid sequence) (SEQ ID NO: __)

MDFQVQIFSFLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 5 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
 TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFVDVWGTGTTVTVSSDQEPKSSDK
 THTSPSPAPELLGGSSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
 DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
 10 KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
 NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
 PGK

5B9 scFv MTHWTCH2CH3 (nucleotide sequence) (SEQ ID NO: __)

15 aagcttgccgcatgaggttctctgctcagcttctggggctgcttgctctggatccctggatccactgcagatattgtgacgca
 ggctgcatctccaatccagtcactcttgaacatcagcttccatctctgcaggtctagtaagagctcctacatagtaatggcatca
 ctatttgtattggtatctgcagaagccaggcagctcctcagctcctgattatcagatgtccaacctgcctcaggagtcccagaca
 ggticagtagcagtggtcaggaactgattcacactgagaatcagcagagtgagggtgaggatgtgggtgttattactgtgctc
 aaaatctagaactccgctcacgttcggtgctgggaccaagctggagctgaacgggggtggcgggtggctcgggcgggtgggt
 20 cgggtggcggcgatcgtcacaggtgcagctgaagcagtcaggacctggcctagtgcagtcctcacagagcctgtccatcacct
 gcacagtctctggttctcattaactacatgctgtacactgggttcgacgtctccaggaaagggtctggagtggctgggagtat
 atggagtgggtgaatcacagactataatgcagcttccatccagactgagcatcaccaaggacgattccaagagccaagtcttctt
 aaaatgaacagtctgaacctaatgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
 ctactggggtaaggaacctcagtcaccgtctctctgatcaggagcccaaatctctgacaaaactcacatccccaccgtcccc
 25 agcacctgaactcctgggggaccgtcagctctctcttcccccaaaaccaaggacacctcatgatctccggacctgag
 gtcacatgcgtggtggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataat
 gccaaagacaaagccggggaggagcagtaacagcacgtaccgtgtggtcagcgtctcaccgtcctgcaccaggactggct
 gaatggcaaggagtacaagtgaaggtctccaacaaagccctcccagccccatcgagaaaacaatctcaaagccaaagggc
 agccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagctgacctgctgtgta
 30 aagcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaaacaactacaagaccacgcctcccggtg
 ctggactccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctc
 cgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

WO 2005/017148

PCT/US2003/041600

5B9 scFv MTHWTCH2CH3 (amino acid sequence) (SEQ ID NO: __)

MRFSAQLLGLLVLPWGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHNSNGITY
LYWYLQKPGQSPQLLIYQMSNLAAGVPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
5 AQNLELPLTFGAGTKLELKRGGGGSGGGGSGGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSSGGITDYNAAFISRLSITKDDSK
SQVFFKMNSLQPNDAIYYCARNGGDNYPIYYAMDYWGQGTSVTVSSDQEPKSS
DKTHTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFNW
YVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPA
10 PIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQP
ENNYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLS
LSPGK

Human IgG1 hinge mutations

2H7 scFv- MTH (CSS) WTCH2CH3 (nucleotide sequence) (SEQ ID NO: __)

15 aagcttgccgccatggatttcaagtcagattttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgtctct
cccagctccagcaatcctgtctgcattccaggggagaaggtcacatgactgcagggccagctcaagtgttaagttacatgcact
ggtagcagcagaagccaggatcctccccaaccctggatttatgccccccaacctggcttctggagtcctgtctgcttcagtg
gcagtggtgtgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccattattactgccagcagtgaggatt
20 taaccacccacgttcggtgtgggaccaagctggagctgaagatggcggtggctcggcggtggatctggaggaggtg
ggagctctcaggcttatctacagcagctcggggtgagctggtgagcgctggggcctcagtgagatgctcgaaggctctggc
tacacattaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
ggtagacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcgggtctatttctgtgaagagtggtgactatagtaactcttactggtagctctgatgtctggggcac
25 agggaccacggtcaccgtctctctgatcaggagcccaaatctgtgacaaaactcacacatccccaccgtcccagcacctgaac
tctggggggaccgtcagcttctcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtg
gtggtggacgtgagccacgaagacctgaggtcaagttcaactggtagctggagcggtgaggtgcataatgccaagacaaag
ccgcgggaggagcagtaaacagcagctaccgtgtgtgtagcgtcctcaccgtctgcaccaggactggctgaatggcaagga
gtacaagtgaaggtctccaacaagccctccagccccatcgagaaaacaatctcaaaagccaaggcgccccgagaac
30 cacaggtgtacacctgccccatcccggtgatgagctgaccaagaaccaggtcagcctgacctgctgtgcaaggcttctatcc
cagcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgcctcccggtgctggactccgac

WO 2005/017148

PCT/US2003/041600

ggctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgttctcatgctccgtgatcatga
ggctctgcacaaccactacacgcagaagagcctctccctgtctccggtaaatgatctaga

2H7 scFv- MTH (CSS) WTCH2CH3 (amino acid sequence) (SEQ ID NO: __)

5 MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFVDVWGTGTTVTVSSDQEPKSCDK
10 THTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLS
PGK

15

2H7 scFv- MTH (SCS) WTCH2CH3 (nucleotide sequence) (SEQ ID NO: __)

aagcctgccgccatggatttcaagtcagatttcagcttctgctaatacagtcctcagtcataatgccagaggacaaatgttctct
cccagctccagcaatcctgtctgcctccaggggagaaggtcacatgactgcagggccagctcaagtgaattacatgcact
ggtagcagcagaagccaggatcctccccaaacctggattatgccccatcaacctggcttctggagtcctgctcgttcagtg
20 gcagtggtgtgggaccttactctcacaatcagcagagtgagggtgaagatgctgccacttactgcccagcagtgagggtt
taaccacccacgttcggtgtgggaccaagctggagctgaagatggcgggtggctggcggtggatcggaggaggtg
ggagctctcaggcttactacagcagctcggggtgagctggtaggcctggggcctcagtgagatgctcgaaggcttctggc
tacacattaccagttacaatatgcactgggtaaagcagacacctagacagggcctggaatggattggagctattatccaggaaat
ggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
25 cagcctgacatctgaagactctgcggtctattctgtgcaagagtggtgtactatagtaactttactggtacttcgatgtctggggcac
agggaccacggtcaccgtctcttgatcaggagcccaaatctctgacaaaactcacacatgccaccgtcccagcacctgaac
tcttggggggaccgtcagcttctcttcccccaaaaccaaggacacctcatgatctccggaccctgaggtcacatgcgtg
gtggaggagctgagccacgaagacctgaggtcaagtcaactggtacgtggacggcgtggaggtgcataatgcaagacaaag
ccgcgggaggagcagtaacagcacgtaccgtgtggtcagcgtctcaccgtctgcaccaggactggctgaatggcaagga
30 gtacaagtgaaggctccaacaaagccctcccagccccatcgagaaaacaatctcaaagccaaagggcagccccgagaac
cacaggtgtacacctgccccatcccggaagagctgaccaagaaccaggtcagcctgacctgcctggtaaggcttctatcc

WO 2005/017148

PCT/US2003/041600

cagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgac
ggctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatga
ggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

- 5 **2H7 scFv- MTH (SCS) WTCH2CH3 (amino acid sequence) (SEQ ID NO: __)**
MDFQVQIFSLLISASVIIARGQIVLSQSPAILSPGKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGSGGGSGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
10 TAYMQLSSLTSEDSAVYFCARVVYYNSYWFVDVWGTGTTVTVSSDQEPKSSDK
THTCPPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
NNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSL
15 SPGK

- 2H7 scFv- MTH (SSC) WTCH2CH3 (nucleotide sequence) (SEQ ID NO: __)**
aagcttgcgccatggatttcaagtcagatttgcagttcctgctaatactgcttcagtcataattgccagaggacaaattgttctct
cccagtcctcagcaatcctgtctgcactccaggggagaaggtcacaatgacttcagggccagctcaagtgttaagttacatgcact
20 ggtaccagcagaagccaggatcctcccccaccctggatttatcccatcaacctggcttctggagtcctgtcgttcagtg
gcagtggtgtcggaccttactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggatt
taaccacccacgttcggtgtcggaccaagctggagctgaagatggcgggtggctcggcggtggtggatctggaggaggtg
ggagctcagggcttatctacagcagtcctgggctgagctggtgaggcctggggcctcagtgagatgtcctgcaaggcttctggc
tacacatttaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
25 ggtgatacttctacaatcagaagttcaaggcaaggccacactgactgtagacaaatcctccagcagcctacatgcagctcag
cagcctgacatctgaagactctcgggtctatttctgtgaagagtggtgtactatagtaacttactgtgacttcgatgtctggggcac
agggaccacggtcaccgtctcttctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtgccagcactgaac
tcttggggggaccgtcagcttctcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtg
gtgtggacgtgagccacgaagacctgaggtcaagtcaactgtcagtggtggcgtggaggtgcataatgccaagacaaag
30 ccgcgggaggagcagtacaacagcagctaccgtgtgtgcagcgtcctcaccgtcctgcaccaggactggctgaatggcaagga
gtacaagtgcaaggtctccaacaagccctccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaac

WO 2005/017148

PCT/US2003/041600

cacaggtgtacacctgccccatcccggtgatgagctgaccaagaaccaggtcagcctgacctgcctggtaaaggcttctatcc
cagcgacatcgccgtggagtgaggagagcaatgggcagccggagagaacaactacaagaccacgcctcccgctgctggactccgac
ggctccttctctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcata
ggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

5

2H7 scFv- MTH (SSC) WTCH2CH3 (amino acid sequence) (SEQ ID NO: __)

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
10 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFVDVWGTGTTVTVSSDQEPKSSDK
THTSPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
15 NNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSL
SPGK

HIgGMHcys1 (nucleotide sequence) (SEQ ID NO: __)

ggt ggt gat cag gag ccc aaa tct tct gac aaa act cac aca tg

20

HIgGMHcys2 (nucleotide sequence) (SEQ ID NO: __)

ggt ggt gat cag gag ccc aaa tct tgt gac aaa act cac aca tct cca ccg tgc

HIgGMHcys3 (nucleotide sequence) (SEQ ID NO: __)

25 ggt ggt gat cag gag ccc aaa tct tgt gac aaa act cac aca tct cca ccg tcc cca gca cct

HuIgG1 MTCH3Y405 (nucleotide sequence) (SEQ ID NO: __)

gggcagccccgagaaccacaggtgtacacctgccccatcccgaggagatgaccaagaaccaggtcagcctgacctgcct
gggtcaaaggcttctatcccgagacatcgccgtggagtgaggagagcaatgggcagccggagagaacaactacaagaccacgcctc

WO 2005/017148

PCT/US2003/041600

ccgtgctggactccgacggctcctctacctctatagcaagctcaccgtggacaagagcagggtggcagcaggggaacgtctctc
atgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

HuIgG1 MTCH3Y405 (amino acid sequence) (SEQ ID NO: __)

5 GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPP
VLDSGDSFYLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

HuIgG1 MTCH3A405 (nucleotide sequence) (SEQ ID NO: __)

gggcagccccgagaaccacaggtgtacacctgcccccatccgggaggagatgaccaagaaccaggtcagcctgacctgcct
10 ggtcaaaggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctc
ccgtgctggactccgacggctccttcgcccctctatagcaagctcaccgtggacaagagcagggtggcagcaggggaacgtctctc
atgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

HuIgG1 MTCH3A405 (amino acid sequence) (SEQ ID NO: __)

15 GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPP
VLDSGDSFALYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

HuIgG1 MTCH3A407 (nucleotide sequence) (SEQ ID NO: __)

Gggcagccccgagaaccacaggtgtacacctgcccccatccgggaggagatgaccaagaaccaggtcagcctgacctgcc
20 tggtaaaggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcct
cccgtgctggactccgacggctccttcttctcgcagcaagctcaccgtggacaagagcagggtggcagcaggggaacgtctctc
catgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

HuIgG1 MTCH3A407 (amino acid sequence) (SEQ ID NO: __)

25 GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPP
VLDSGDSFFLASKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

HuIgG1 MTCH3Y405A407 (nucleotide sequence) (SEQ ID NO: __)

WO 2005/017148

PCT/US2003/041600

gggcagccccgagaaccacaggtgtacacctgcccccatccgggaggagatgaccaagaaccaggtcagcctgacctgcct
gggtcaaaggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctc
ccgtgctggactccgacggctccttctacctcgccagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctc
atgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

5

HuIgG1 MTCH3Y405A407 (amino acid sequence) (SEQ ID NO: __)

GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPP
VLDSGDSFYALASKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

10

HuIgG1 MTCH3A405A407 (nucleotide sequence) (SEQ ID NO: __)

gggcagccccgagaaccacaggtgtacacctgcccccatccgggaggagatgaccaagaaccaggtcagcctgacctgcct
gggtcaaaggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctc
ccgtgctggactccgacggctccttgcctcgcagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttct
catgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

15

HuIgG1 MTCH3A405A407 (amino acid sequence) (SEQ ID NO: __)

GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPP
VLDSGDSFALASKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

20

2H7 scFv MTH (SSS) WTCH2MTCH3Y405 (nucleotide sequence) (SEQ ID NO: __)

aagcttgcgccaatggatttcaagtgcagatttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttgcagggccagctcaagtgttaattacatgcact
ggtagcagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtgggtctgggaccttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtgaggattt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcgggagggtggatctggaggaggtg
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tacacattaccagttacaatatgcactgggtaaagcagacacctagacaggcctggaatggattggagctatttatccaggaat
gggtatacttctacaatcagaagtcaaggccaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtactatagtaactcttactgggtactctgatgtctggggcac
agggaccacggtcaccgtctctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtccccagcacctgaac

30

WO 2005/017148

PCT/US2003/041600

tcctgggggaccgtcagttctctctcccccaaaaccaaggacacctcatgatctccggaccttgaggtcacatgctg
gtgggtggacgtgagccacgaagacctgaggtcaagttcaactggtagtgacggcgtggaggtgcataatgccaagacaaag
ccgggggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaagga
gtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaacaatctccaaagccaaaggcagccccgagaac
5 cacaggtgtacacctgccccatccgggaggagatgaccaagaaccaggtcagcctgacctgctgtaaaaggcttctatcc
cagcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgac
ggctccttctacctctatagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatga
ggctctgcacaaccactacacgcagaagagcctctcctgtccccgggtaaatgatctaga

10 **2H7 scFv MTH (SSS) WTCH2MTCH3Y405 (amino acid sequence) (SEQ ID NO: __)**
MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYIAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
15 TAYMQLSSLTSEDSAVYFCARVVYYSNSYWYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSGDFYLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLS
20 PGK

2H7 scFv MTH (SSS) WTCH2MTCH3A405 (nucleotide sequence) (SEQ ID NO: __)
aagcttgccgcatgatttcaagtgcagattttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
cccagcttccagcaatcctgtctgcatctccaggggagaagggtcacaatgacttgaggccagctcaagtgaattacatgcact
25 ggtaccagcagaagccaggatcctccccaaacctggatttatccccatccaacctggcttctggagtccctgctcgttcagtg
gcagtggtgtgggaccttactcttcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtgaggatt
taaccacccacgttcggtgctgggaccaagctggagctgaagatggcgggtggctcgggcgggtggatctggaggagggtg
ggagctctcaggcttatctacagcagctggggctgagctggtgaggcctgggcctcagtgaaatgtcctgcaaggcttctggc
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30 ggtgatacttctacaatcagaagttcaagggcaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
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WO 2005/017148

PCT/US2003/041600

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2H7 scFv MTH (SSS) WTCH2MTCH3A405 (nucleotide sequence) (SEQ ID NO: __)

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20 2H7 scFv MTH (SSS) WTCH2MTCH3A407 (nucleotide sequence) (SEQ ID NO: __)

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WO 2005/017148

PCT/US2003/041600

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15 THTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
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2H7 scFv MTH (SSS) WTCH2MTCH3Y405A407 (nucleotide sequence) (SEQ ID NO: __)

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WO 2005/017148

PCT/US2003/041600

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2H7 scFv MTH (SSS) WTCH2MTCH3Y405A407 (amino acid sequence) (SEQ ID NO: __)

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20 KTISKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
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2H7 scFv MTH (SSS) WTCH2MTCH3A405A407 (nucleotide sequence) (SEQ ID NO: __)

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WO 2005/017148

PCT/US2003/041600

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2H7 scFv MTH (SSS) WTCH2MTCH3A405A407 (amino acid sequence) (SEQ ID
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 20 TAYMQLSSLTSEDSAVYFCARVYYSNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
 THTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
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 KTISKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
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 25 PGK

2H7 scFv MTH (SCC) WTCH2CH3 (nucleotide sequence)
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WO 2005/017148

PCT/US2003/041600

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2H7 scFv MTH (SCC) WTCH2CH3 (amino acid sequence)

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2H7 scFv MTH (CSC) WTCH2CH3 (nucleotide sequence)

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WO 2005/017148

PCT/US2003/041600

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2H7 scFv MTH (CSC) WTCH2CH3 (amino acid sequence)

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2H7 scFv MTH (CCS) WTCH2CH3 (nucleotide sequence)

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WO 2005/017148

PCT/US2003/041600

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2H7 scFv MTH (CCS) WTCH2CH3 (amino acid sequence)

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30 **HuIgAHIgA-T4-ORF (nucleotide sequence)**

WO 2005/017148

PCT/US2003/041600

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5 cgctaaccgccaccctctcaaaatccggaaacacattccggcccagggtccacctgctgccgccgctcgaggagctggccc
tgaacgagctgggtgacgtgacgtgcctggcacgtggcttcagccccaaggatgtgctggttcgctggctgcaggggtcacagg
agctgccccgcgagaagtacctgacttgggcatccggcaggagcccagccagggcaccaccaccttgcgtgtgaccagcata
ctgcgctggcagccgaggactggaagaagggggacaccttctctgcatggtggccacaggccctgccgtggccttcac
acagaagaccatcgaccgcttggcgggtaaacccacccatgtcaatgtgtctgtgtcatggcggaggtggacgcggatccttga
10 ac

HuIgAHIgA-T4-ORF (amino acid sequence)

DQVPVSTPPTSPSTPPTSPSCCHPRLSLHRPALEDLLLGSEAILTCTLTGLRDASGV
TFTWTPSSGKSAVQGPDRDLGCGYSVSSVLPGCAEPWNHKGTFCTAAYPESKT
15 PLIATLSKSGNTFRPEVHLLPPPSEELALNELVTLTCLARGFSPKDVLRWLQGSQ
ELPREKYLTWASRQEPSQGTTFFAVTSILRVA AEDWKKGDTFSCMVGHEALPLAF
TQKTIDRLAGKPTHVNVSVVMAEVDADPSN

1D8-IgAH IgA-T4-CD80 (nucleotide sequence)

20 aagcttatggattttcaagtgcagatttcagcttctgctaatacgtgcttcagtcataatgtccagaggagtcgacattgtgctcactc
agtctccaacaacatagctgcatctccaggggagaaggtcaccatcacctgccgtgccagctccagtgaagtacatgtactggt
accagcagaagtcaggcgccctcccctaaactctggatttatgacacatccaagctggcttctggagttccaaatcgcttcagtggca
gtgggtctgggacctctattctctcgaatcaacaccatggagactgaagatgctgccacttattactgtcagcagtgagtagtact
ccgctcacgttcgggtctgggaccaagctggagatcaaacgggggtggcgggtggctcgggcgggtgggtgggtggcggcg
25 gatctcaggtgcagctgaaggaggcaggacctggcctgggtgcaaccgacacagacctgtccctcacatgcactgtctctgggtt
ctcattaaccagcgtggtgtacactggattcgacagcctccaggaaagggtctggaatggatgggaataatatattatgatggagg
cacagattataattcagaattaaatccagactgagcatcagcaggacacctccaagagccaagtttcttaaaaaataacagctctg
caaatgatgacacagccatgtattactgtgccagaatccactttgattactggggccaaggagtcattggtcacagtctcctctgac
agccagttccctcaactccacctaccccatctccctcaactccacctaccccatctccctcatgctgccacccccgactgtcactgca
30 ccgaccggccctcgaggacctgctcttaggttcagaagcgatcctcacgtgcacactgaccggcctgagagatgcctcaggtgtc
accttcacctggacgccctcaagtgggaagagcgctgttcaaggaccacctgacctgtgtggctgctacagcgtgtcca

WO 2005/017148

PCT/US2003/041600

gtgtcctgccgggctgtgccgagccatggaacatgggaagaccttcactgcactgctgcctaccccagtgccaagaccccgt
aaccgccaccctctcaaatccggaaacacattccggcccagggtccacctgctgccgccccgtcgaggagctggccctgaa
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gccccgcgagaagtacctgacttgggcatcccgaggagcccagggcaccaccaccttcgctgtgaccagcatactgc
5 gctgtggcagccgaggactggaagaagggggacaccttctctgcatggtgggcccagaggccctgccgtggccttcacacag
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cctgtcccatcctgggcccattaccttaatctcagtaaatggaattttgtgatgtgctgcctgacctactgctttccccaagatgcag
agagagaaggaggaatgagagattgagaagggaagtgtacgccctgtataaatcgatac

AA

10 **1D8 scFv IgAH IgA-T4-CD80 (amino acid sequence)**

MDFQVQIFSFLISASVIMSRGVDIVLTQSPTTIAASPGKEVTITCRASSSVSYMYWY
QQKSGASPKLWIYDTSKLGSGVGNRFSGSGSGTSYSLAINTMETEDAATYYCQQW
SSTPLTFSGTKLEIKRGGGSGGGGSGGGGSGVQLKEAGPGLVQPTQTLSTCTV
SGFSLTSDGVHWIRQPPGKGLEWMGIHYDGGTDYNSAIKSRLSISRDTSKSQVFLK
15 INSLQTTDDTAMYYCARIHFDYWGQGMVTVSSDQVPSTPPTPSPSTPPTPSPSCC
HPRLSLHRPALEDLLLGSEAILTCTLTGLRDASGVTFTWTPSSGKSAVQGPPDRDL
CGCYSVSSVLPGAEPWNHGKTFTCTAAYPESKTPLTATLSKSGNTRPEVHLLPP
PSEELALNELVTLTCLARGFSPKDVLRWLQGSQELPREKYLTWASRQEPSQGT
FAVTSILRVAEDWKKGDTFSCMVGHEALPLAFTQKTIDRLAGKPTHVNVSVVM
20 AEVDADPSNNLLPSWAITLISVNGIFVICCLTYCFAPRCRERRRNERLRRESVRPV

human IgE Fc (CH2-CH3-CH4) ORF (nucleotide sequence)

tgtacacgtctgtccaggacttcacccgccaccgtgaagatcttacagtcgtcctgcagggcgggcacttcccccg
accatccagctcctgtgcctcgtctctgggtacacccagggactatcaacatcacctggctggaggacgggcagggtcatggacg
25 tggactgtccaccgctctaccacgcaggagggtgagctggcctccacaaaagcgagctcacctcagccagaagcactggc
tgtcagaccgcacctacacgtgccaggtcacctatcaaggtcacaccttgaggacagcaccagaaggtgtgcagattccaacc
gagaggggtgagcgctacctaagccggccagcccgttcacgtgttcacgcaagtcgccacgatcacctgtctggtggtg
gacctggcaccagcaaggggaccgtgaacctgacctgtgtccggggccagtggaagcctgtgaaccactccaccagaaagg
aggagaagcagcgcaatggcacgttaacctgcacgtccacctgccggtgggcacccgagactggatcgagggggagacct
30 ccagtgcagggtgaccacccccacctgccaggccctcatcggtccacgaccaagaccagcgcccgctgctgccccg
gaagtctatgcgttgcgacgccggagtgccggggagccgggacaagcgaccctgcctgctgatccagaactcatgct

WO 2005/017148

PCT/US2003/041600

gaggacatctcggcagtgaggcgcacacgaggtgcagctcccgagcccgccacagcagcagccccgcaagacc
aagggctccggcttctcgtcttcagccgcctggaggtgaccagggccgaatgggagcagaaagatgagttcatctgccgtgcag
tccatgaggcagcgagccccctcacagaccgtccagcgagcgggtgtctgtaaatcccggtaaagcggatccttcgaa

AA

5 **human IgE Fc (CH2-CH3-CH4) ORF (amino acid sequence)**

DHVCSDFTPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDV
DLSTASTTQEGELASTQSELTLSQKHWLSDRTYTCQVTYQGHTFEDSTKKCADSN
PRGVSAAYLSRSPFDLFIKRSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKE
EKQRNGTLTVTSTLPVGTRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPE
10 VYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTK
GSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGKADPS

1D8 scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (nucleotide sequence)

aagcttatggatttcaagtcagatlttcagcttctgtaatacagtgcttcagtcataatgtccagaggagtcgacatltgctcactc
15 agtctccaacaaccatagctgcatctccaggggagaaggcaccatcacctgccgtgccagctccagtgtaagttacatgtactggt
accagcagaagtcaggcgcctccccctaaactctgatttatgacacatccaagctggcttctggagttccaaatcgcttcagtgga
gtgggtctgggacctcttattctctcgaatcaacacatggagactgaagatgctgccacttattactgacagcagtgaggtagtact
ccgctcacgttcgggtctgggaccaagctggagatcaaacgggggtggcgggtggctcgggcgggtgggtgggtggcggcg
gatctcaggtgcagctgaaggaggcaggacctggcctggtgcaaccgacacagaccctgtccctcacatgcactgtctctgggtt
20 ctcaataaccagcagtggtgtactggttcgacagcctccaggaaagggtctggaatggatgggaataatattatgatggagg
cacagattataattcagcaattaaatccagactgagcatcagcaggacacctccaagagccaagtttcttaaaaatcaacagctg
caaactgatgacacagccatgtattactgtgccagaatccacttgattactggggccaaggagtcagtggtcacagtcctctgatc
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ccagctcctgtgcctcgtctctgggtacacccagggactatcaacatcacctggctggaggacgggcaggtcatggacgtggac
25 ttgtccaccgcctctaccacgcaggagggtgagctggcctccacaaaagcagctcacctcagccagaagcactggctgtca
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30 cagggtgacccacccccacctgcccagggccctcatcggtccacagaccaagaccagcgcccgctgctgccccggaagtct
atgcgttgcgacgccggagtgccggggagccgggacaagcgcaccctcgctgcctgatccagaactcatgcctgaggac

WO 2005/017148

PCT/US2003/041600

atctcgggtgcagtggctgcacaacgaggtgcagctcccgacgcccggcacagcacgacgagccccgaagaccaagggct
ccggcttcttctgtctcagccgcctggaggtgaccagggccgaatgggagcagaaagatgagttcatctgccgtgcagtcctatga
ggcagcgagccccctcacagaccgtccagcagcgggtgtctgtaaattcccgtaaagcggatccttcgaagctcccatcctgggc
cattacctaattctcagtaaatggaattttgtgatgtctgcctgacctactgctttgcccccaagatgcagagagagaaggagggaatg
5 agagattgagaagggaaaagtgtacgccctgtataaatcgata

1D8-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (amino acid sequence)

MDFQVQIFSLLISASVIMSRGVDIVLTQSPTTIAASPGEKVTITCRASSSVSYMYWY
QQKSGASPKLWIYDTSKLGSGVGNRFSGSGSGTSYSLAINTMETEDAATYYCQQW
10 SSTPLTFGSGTKLEIKRGGGGSGGGGSGGGGSQVQLKEAGPGLVQPTQTLSLTCTV
SGFSLTSDGVHWIRQPPGKGLEWMGIYYDGGTDYNSAIKSRLSISRDTSKSQVFLK
INSLQTDDTAMYYCARIHFDYWGQGVMTVSSDHVCSRDFTPPTVKILQSSCDGG
GHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTASTTQEGELASTQSELTL
QKHWLSDRTYTCQVTYQGHTFEDSTKKCADSNPRGVSAYLSRPSPFDLFIRKSPTI
15 TCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNGTLTVTSTLPVGTRDWI
EGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATPEWPGSRDKRTLACLI
QNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKGSGFFVFSRLEVTRAWEQKDE
FICRAVHEAASPSQTVQRAVSVNPGKADPSKLPWAITLISVNGIFVICCLTYCFAP
RCRERRRRNERLRRESVRPV

20

5B9-IgAH IgA-T4-CD80 (nucleotide sequence)

aagcttgccgccatgaggttctctgctcagcttctggggctgcttctgctctggatccctggatccactgcagataattgtgatgacgca
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cttatttgatttggtatctgcagaagccaggccagtcctcctcagctcctgatttatcagatgtccaacctgcctcaggagtcacagaca
25 ggttcagtagcagtggtcaggaactgattcacactgagaatcagcagagtgaggagtgaggatgtgggtgtttattactgtgctc
aaaactagaactccgctcacgttcggtgctgggaccaagctggagctgaaacgggggtggcgggtggctcgggcgggtgggtgggt
cgggtggcggcgatgctcacaggtgcagctgaagcagtcaggacctggcctagtgcagtcctcacagagcctgtccatcacct
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30 aaaatgaacagtctgcaacctaatgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
ctactgggggtcaaggaaacctcagtcaccgtctcctctgatcagccagttccctcaactccacctaccccatctccctcaactccacct

WO 2005/017148

PCT/US2003/041600

accccatctccctcatgctgccacccccgactgtcaactgcaccgaccggccctcgaggacctgctcttaggttcagaagcgatcct
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5 cacctgctgccgccgccgtcgaggagctggccctgaacgagctggtgacgctgacgtgcctggcagctggcttcagcccca
ggatgtgctggttcgctggctgcaggggtcacaggagctgccccgcgagaagtacctgacttgggcatcccggcaggagccca
gccagggcaccaccaccttcgctgtgaccagcactgcgcgtggcagccgaggactggaagaagggggacaccttctcctgc
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ctgtgtcatggcggaggtggacgcggatccttcgaacaacctgctcccatcctggccattaccttaatctcagtaaatggaatttt
10 gtgatatgctgcctgacctactgctttgccccaaagatgcagagagagaaggaggaatgagagattgagaagggaagtgtacgcc
ctgtataaatcgatac

5B9-IgAH IgA-T4-CD80 (amino acid sequence)

MRFSAQLLGLLVLPWPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHNSNGITY
15 LYWYLQKPGQSPQLLIYQMSNLASGVPDFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLIFGAGTKLELKRGGGSGGGGSGGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSSGITDYNAAFISRLSITKDDSK
SQVFFKMNSLQPNDAIYYCARNGGDNYPIYYAMDYWGQGTSTVTVSSDQVPVST
PPTPSPSTPPTPSPSCCHPRLSLHRPALEDLLLSEAILTCTLTGLRDASGVTFWTTPS
20 SGKSAVQGPPDRDLGCGYSVSSVLPGCAEPWNHKGKTFCTAAYPESKTPLTATLS
KSGNTFRPEVHLLPPPSEELALNELVTLTCLARGFSPKDLVRWLQGSQELPREKY
LTWASRQEPSQGTTFFAVTSILRVAAEDWKKGDTFSCMVGHEALPLAFTQKTIDR
LAGKPTHVNVSVVMAEVDADPSNNLLPSWAITLISVNGIFVICCLTYCFAPRCRER
RRNERLRRESVRPV

25

5B9-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (nucleotide sequence)

aagcttgccgcatgaggttctctgctcagcttctggggctgcttgtgctctggatccctggatccactgcagataattgtgatgacga
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cttatttgatttgatctgcagaagccaggccagctcctcagctcctgatttatcagatgtccaacctgcctcaggagctccagaca
30 gggtcagtagcagtggtcaggaaactgattcacactgagaatcagcagagtgagggtgaggatgtgggtgtttattactgtgctc
aaaatctagaactccgctcacgttcggtgctgggaccaagctggagctgaaacgggggtggcgggtggctcgggcgggtgggtgggt

WO 2005/017148

PCT/US2003/041600

cgggtggcggcgatcgtcacaggtgcagctgaagcagtcaggacctggcctagtgcagtcctcacagagcctgtccatcacct
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atggagtgggtgaatcacagactataatgcagctttcatatccagactgagcatcaccaaggacgattccaagagccaagtttttt
aaaatgaacagtctgcaacctaataacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
5 ctactggggtaaggaacctcagtcaccgtctctctgatcacgtctgtccagggacttcacccgcccaccgtgaagatcttaca
gtctctctgcgacggcgggggcacttccccccaccatccagctctgtgcctcgtctctgggtacacccagggactatcaac
atcacctggctggaggacgggcaggtcatggacgtggacttgcaccgcctctaccacgcaggaggggtgagctggcctccaca
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aggacagcaccaagaagtgtgcagattccaacccgagaggggtgagcgctacctaagccggcccagcccgttcgacctgttca
10 tccgcaagtcgcccacgatcacctgtctgggtgggacctggcaccagcaaggggaccgtgaacctgacctggctcccgggcca
gtgggaagcctgtgaaccactccaccagaaggaggagaagcagcgcaatggcacgttaaccgtcacctccacctgccggtg
ggcacccgagactggatcaggggggagacctaccagtgcaggggtgacccacccccacctgccaggggccctcatcggtcca
cgaccaagaccagcgcccgcgtgtgtccccggaagtctatgcgtttgcgacgcccggagtggccggggagccgggacaagc
gcacctcgcctgcctgatccagaacttcatgcctgaggacatctcgggtgcagtggctgcacaacgaggtgcagctcccggacgc
15 ccggcacagcacgacgcagccccgaagaccaagggtccggcttctcgtcttcagccgcctggaggtgaccaggggccgaat
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actgctttgccccaaagatgcagagagagaaggaggaatgagagattgagaagggaagtgtacgccctgtataaatcgata

20 **5B9-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (amino acid sequence)**

MRFSAQLLGLLVLPWIPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLLSNGITY
LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGSGGGGSGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSGGITDYNAAFISRLSITKDDSK
25 SQVFFKMNSLQPNDAIYYCARNGGDNYPIYYAMDYWGQGTSVTVSSDHVCSR
DFTPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTAS
TTQEGELASTQSELTLSQKHWLSDRTYTCQVTYQGHTFEDSTKKCADSNPRGVSA
YLSRPSFDLFIKSPITITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNG
TLTVTSTLPVGTDRDIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATP
30 EWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKGSGFFVFS
RLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVPNGKADPSKLPSWAITLISV
NGIFVICCLTYCFAPRCRERRRNERLRRESVRPV

WO 2005/017148

PCT/US2003/041600

2e12-scFv-IgAH IgA-T4-CD80 (nucleotide sequence)

aagcttatggattttcaagtcagattttcagcttcctgctaatacagtgcttcagtcataatgtccagaggagtcgacattgtgctcacc
aatctccagcttctttggctgtgtctctaggtcagagagccaccatctcctgcagagccagtgaaggttgatattatgtcacaaagt
5 taatgcagtggtaccaacagaaaccaggacagccacccaaactcctcatctctgctgcatccaacgtagaatctggggctccctgcc
aggtttagtggcagtgggctctgggacagacttcagcctcaacatccatcctgtggaggaggatgatattgcaatgtattctgtcagc
aaagtaggaaggttccttgacgttcggaggagccaccaagctggaatcaaacgggggtggcgggtggctcgggcggaggtggg
tcgggtggcggcgatctcaggtgcagctgaaggagtcaggacctggcctggcggcctcacagagcctgtccatcacatgc
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10 atgggggtgatggaagcacagactataattcagctctcaaatccagactgagcatcaccaaggacaactccaagagccaagtttctt
aaaaatgaacagctgcaaactgatgacacagccagatactactgtgccagagatggttatagtaactttcattactatgttatggact
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acgtgcacactgaccggcctgagagatgcctcaggtgtcaccttcacctggacggcctcaagtgggaagagcgctgttcaaggac
15 cacctgacagtgacctctgtggctgtacagcgtgtccagtgctcctgccgggctgtgccgagccatggaacctgggaagaccttc
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ccagggcaccaccaccttcgctgtgaccagcatactgcgctggcagccgaggactggaagaagggggacaccttctcctgcat
20 ggtgggccacgaggccctgccgctggccttcacacagaagaccatcgaccgttggcgggtaaacccacccatgtcaatgtgtct
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gatatgtgcctgacctactgcttggcccaagatgcagagagagaaggaggaatgagagattgagaagggaagtgtacgcct
gtataaatcgatac

25 2e12-scFv-IgAH IgA-T4-CD80 (amino acid sequence)

MDFQVQIFSLLISASVMSRGVDIVLTQSPASLAVSLGQRATISCRASESVEYYVTS
LMQWYQQKPGQPPKLLISAASNVESGVPARFSGSGSGTDFSLNIHPVEEDDIAMYF
CQQSRKVPWTFGGGTKLEIKRGGGSGGGGSGGGGSQVQLKESGPGLVAPSQSL
ITCTVSGFSLTGYGVNWRQPPGKLEWLGMWGDGSTDYNSALKSRLSITKDNS
30 KSQVFLKMNSLQTDRTARYYCARDGYSNFHYVMDYWGQGTSTVTVSSDQPVPS
TPPTPSPSTPPTPSPSCCHPRLSLHRPALEDLLLGSEAILTCTLTGLRDASGVTFWTWP
SSGKSAVQGPPDRDLGCYSVSSVLPGCAEPWNHKGKTFTCTAAYPESKTPLTATLS

WO 2005/017148

PCT/US2003/041600

KSGNTFRPEVHLLPPPSEELALNELVTLTCLARGFSPKDVLRWLQGSQELPREKY
LTWASRQEPSQGTTFFAVTSILRVAEDWKKGDTFSCMVGHEALPLAFTQKTIDR
LAGKPTHVNVSVVMAEVDADPSNNLLPSWAITLISVNGIFVICCLTYCFAPRCRER
RRNERLRRESVRPV

5

2e12-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (nucleotide sequence)

aagcttatggatttcaagtgcagatttcagcttcctgctaatacagtcctcagtcataatgtccagaggagtcgacattgtgtcaccc
aatctccagcttcttggctgtgtctctaggtcagagagccaccatctctgcagagccagtgaagtgttgatattatgtcacaagtt
taatgcagtggtaccaacagaaaccaggacagccacccaaactcctcatctctgctgcaccaacgtagaatctggggtccctgcc
10 aggttttagtggcagtgggctctgggacagacttcagcctcaacatccatcctgtggaggaggatgatattgcaatgtatttctgtcagc
aaagtaggaaggttccttggacgttcgggtggaggcaccagctggaaatcaaacggggtggcgggtggctcgggcggaggtggg
tcgggtggcggcgatctcaggtgcagctgaaggagtcaggacctggcctgggtggcgccctcacagagcctgtccatcacatgc
accgtctcagggttctcattaaccggctatggtglaaactgggttcgccagcctccaggaaagggtctggagtggctgggaatgat
atggggtgatggaagcacagactataattcagctctcaaattccagactgagcaicaccaaggacaactccaagagccaagtlttct
15 aaaaatgaacagctgcaaactgatgacacagccagataactactgtgccagagatggttatagtaacttccattatgttatggact
actggggtaaggaacctcagtcaccgtctcctcagatcacgtctgtccagggttcaccccgccaccgtgaagatcttacag
tcgtctcgcagcggcggcgacacttcccccgaccatccagctcctgtgcctcgtctctgggtacaccccagggaactatcaacat
cacctggctggaggacgggcaggtcatggacgtggacttgtccaccgcctctaccacgcaggagggtgagctggcctccacac
aaagcgagctcaccctcagccagaagcactggctgtcagaccgcacctacacctgccaggtcacctatcaaggtcacaccttga
20 ggacagcaccaagaagtgtgcagattccaacccgagaggggtgagcgcctacctaagccggcccagcccgttcgacctgttcat
ccgcaagtcgccacgatcacctgtctggtgggtggacctggcaccagcaaggggacctgtaacctgacctggtccgggcca
gtgggaagcctgtgaaccactccaccagaaaggaggagaagcagcgaatggcacgttaacctgcacgtccacctgccggtg
ggcaccggagactggatcgagggggagacctaccagtgcagggtgacccacccccacctgccaggggccctcatcggtcca
cgaccaagaccagcggcccgctgtgccccggaagtctatgcgttgcgacgccggagtggccggggagccgggacaagc
25 gcacctcgcctgcctgatccagaactcatgcctgaggacatctcgggtcagtggtgcacaacgaggtgcagctcccggaagc
ccggcacagcacgacgcagccccgaagaccaagggtccggcttctgtcttcagccgcctggaggtgaccagggccgaat
gggagcagaaagatgagttcatctgccgtgcagtcctatgaggcagcagccccctcacagacctccagcgagcgggtgtctgtaa
atcccggtaaagcgatccttgaagctcccacctgggccattacctaatctcagtaaatggaattttgtgatatgtgcctgacct
actgctttgccccaaagatgcagagagagaaggaggaatgagagattgagaagggaagtgtacgccctgtataaatcgata

30

2e12-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (amino acid sequence)

WO 2005/017148

PCT/US2003/041600

MDFQVQIFSFLISASVIMSRGVDIVLTQSPASLAVSLGQRATISCRASESVEYYVTS
LMQWYQQKPGQPPKLLISAASNVESGVPARFSGSGSGTDFSLNIHPVEEDDIAMYF
CQQSRKVPWTFGGGTKLEIKRGGGSGGGGSGGGGSQVQLKESGPGLVAPSQSLS
ITCTVSGFSLTGYGVNWVRQPPGKLEWLGMWGDGSTDYNSALKSRLSITKDNS
5 KSQVFLKMNSLQDDTARYYCARDGYSNFHYVMDYWGQGTSTVTVSSDHVCSR
DFTPPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTAS
TTQEGELASTQSELTLSQKHWLSDRITYTCQVTYQGHTFEDSTKKCADSNPRGVSA
YLSRPSFDFLIRKSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNG
TLTVTSTLPVGTRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATP
10 EWPGRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKSGGFFVFS
RLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGKADPSKLPSWAITLISV
NGIFVICCLTYCFAPRCRERRRNERLRRESVRPV

500A2 scFv (nucleotide sequence)

15 atgttgtatcacatctcagctccttgggcttttactcttctggatttcagcctccagaagtgacatagtgctgactcagactccagccactc
tgtctctaattcctggagaaagagtcacaatgacctgtaagaccagtcagaatattggcacaatctacactggatccacaaaaacc
aaaggaggctccaagggtctcatcaagtatgcttcgcagtcacatcctgggatccctccagattcagtggcagtggtcggaaac
agatttcactctcagcatcaataacctggagcctgatgatcggaaatttactgtcaaaaagtagaagctggcctgtcacgttcg
gtcctggcaccagaagctggagataaaacggggtggcggtggctcggcgagggtgggtggcgggatctcaggtcaa
20 gctgcagcagtcgggttctgaactagggaaacctggggcctcagtgaaactgtcctgcaagacttcaggctacatattcacagatc
actatatcttgggtgaaacagaagcctggagaaagcctgcagtggaatggaatgtttatgggtgaaatgggtgacaagctaca
atcaaaaattccagggaaggccacactgactgtagataaaatctctagcacagcctacatggaactcagcagcctgacatctgag
gattctgccatctattactgtgcaagaaggccggtagcgacgggccatgctatggactactggggtcaggggatccaagttaccgt
ctcctctgac

25

500A2 scFv (amino acid sequence)

MLYTSQLLGLLLFWISASRSDIVLTQTPATLSLIPGERVTMTCKTSQNIGTILHWYH
QKPKEAPRALIKYASQSIPGIPSRFSGSGSETDFTLSINNLEPDDIGIYYCQQSRSWPV
TFGPGTKLEIKRGGGSGGGGSGGGGSQVKLQQSGSELGKPGASVKLSCKTSGYIF
30 TDHYISWVKQKPGESLQWIGNVYGGNGGTSYNQKFQGKATLTVDKISSTAYMEL
SSLTSEDSAIYYCARRPVATGHAMDYWGQGIQVTVSSD

WO 2005/017148

PCT/US2003/041600

NT

5' oligo:

Name : IgGWT3

GTTGTTTTCTGAAGGATCCGCTTTACCCGGAGACAGGGAGAGGCTCTT

5 NT

3' oligo:

Name : hIgGWT5

GTTGTTAGATCTGGAGCCCAAATCTTGTGACAAAACCTCACACATG

NT

10 5' oligo:

Name : FADD5

Sequence

GTTGTGGATCCTTCGAACCCGTTCTTGGTGCTGCTGCACTCGGTGTCG

NT

15 3' oligo:

Name : FADD3

Sequence

GTTGTTATCGATCTCGAGTTATCAGGACGCTTCGGAGGTAGATGCGTC

NT

20 **FADD-CSSCFV (nucleotide sequence)**

gtggatccttcgaacccgttcctggtgctgctgcacitcgggtgctgctccagcctgtcgagcagcgagctgaccgagctcaagttccta
tgccctcggggcgctgggcaagcgcaagctggagcgctgcagagcggcctagacctcttccatgctgctggagcagaacga
cctggagcccgggcacaccgagctcctgcgcgagctgctgcctccctcgggcgccacgacctgctgcggcgctcgacgact
tcgagggcgggggcgggcgccggggccgcctggggaagaagacctgtgtgcagcatttaacgtcatatgtgataatgtgggg
25 aaagattggagaaggctggctcgtcagctcaaagtctcagacaccaagatcgacagcatcgaggacagataaccccgcaacctg
acagagcgtgtgcgggagtcactgagaatctggaagaacacagagaaggagaacgcaacagtggcccacctgggtgggggctc
tcaggtcctgccagatgaacctgggtggctgacctggtacaagagggtcagcaggccccgtgacctccagaacaggagtggggcca
tgtccccgatgtcatggaactcagacgcactctacctccgaagcgctcctgataactcgagatcgataaacaac

30 **FADD-CSSCFV (amino acid sequence)**

PCT/US2003/041600

5

GTTGTGGATCCTCCCTTTTGGGTGCTGGTGGTGGTTGGTGTCTTGGCTTGCTAT
AGCTTG

GTTGTTTCGAACCCAGAAAATAATAAAGGCCACTGTTACTAGCAAGCTATAGC
AAGCCAG

15 GTTGTGGATCCTCCCTTTTGGGGTGCTGGTGGT

GTTGTTTCGAACCCAGAAAAATAATAAAGGCCAC

GTTGTGGATCCTCCTGCTCCCATCCTGG

25 GTTGTTTCGAACGGCAAAGCAGTAGGTCAGGC

GTTGTGGATCCTTCGAACCCATTCCTGGTGCTGCTGCACTCGCTG

WO 2005/017148

PCT/US2003/041600

MFADD3XC (nucleotide sequence)

GTTGTTATCGATCTCGAGTCAGGGTGTCTTCTGAGGAAGACAC

- 5 **Murine FADD nucleotide sequence** (full length, but without flanking -Ig or transmembrane sequences) (nucleotide sequence)

gtggatccttgaacatggaccattcctggtgctgctgcactcgtgtccggcagcctgtcgggcaacgatctgatggagctcaa
gtttctgtccgcgagcgcgtgagcaaacgaaagctggagcgcgtgcagagtggcctggacctgttcacgggtgctgctggagca
gaacacctggagcgcgggcacaccgggctgctgcgcgagttgctggcctcgtgcgccgacacgatctactgcagcgcctgg
10 acgacttcgaggcggggacggcgaccgctgcgccccgggggaggcagatctgcaggtggcatttgacattgtgtgtgacaatg
tggggagagactggaaaagactggcccgcgagctgaaggtgtctgaggccaagatggatgggattgaggagaagtacccccg
aagtctgagtgagcgggtaaggagagctctgaaagtctggaagaatgctgagaagaagaacgcctcgggtggccggactggtca
aggcgcctgcggacctgcaggctgaatctggtggctgacctggtggaagaagcccaggaatctgtgagcaagagtgagaatatgt
ccccagtactaagggttaactgtgttctcctcagaaacacctgactcgagatcgat

15

Murine FADD (amino acid sequence)

VDPSNMDPFLVLLHSLSGSLSGNDLMELKFLCRERVSKRKLERVQSGLDLFTVLLE
QNDLERGHTGLLRELLASLRRHDLQRLDDFEAGTATAAPPGEADLQVAFDIVCD
NVGRDWKRLARELKVSEAKMDGIEEKYPRSLSERVRESLKVWKNAEKKNASVA
20 GLVKALRTCRLNLVADLVEEAQESVSKSENMSPVLRDSTVSSSETP

MCASP3-5 (nucleotide sequence)

GTTGTGGATCCTTCGAACATGGAGAACAACAAAACCTCAGTGGATTCA

- 25 **MCASP3-3 (nucleotide sequence)**

GTTGTTATCGATCTCGAGCTAGTGATAAAAGTACAGTTCTTTTCGT

MCASP8-5 (nucleotide sequence)

GTTGTTTCGAACATGGATTTCAGAGTTGTCTTTATGCTATTGCTG

WO 2005/017148

PCT/US2003/041600

MCASP8-3 (nucleotide sequence)

GTTGTTATCGATCTCGAGTCATTAGGGAGGGAAGAAGAGCTTCTTCCG

5 **hcasp3-5(nucleotide sequence)**

GTTGTGGATCCTTCGAACATGGAGAACACTGAAAACTCAGTGGAT

hcasp3-3 (nucleotide sequence)

GTTGTTATCGATCTCGAGTTAGTGATAAAAATAGAGTTCTTTTGTGAG

10

hcasp8-5 (nucleotide sequence)

GTTGTGGATCCTTCGAACATGGACTTCAGCAGAAATCTTTATGAT

hcasp8-3 (nucleotide sequence)

15 GTTGTTATCGATGCATGCTCAATCAGAAGGGAAGACAAGTTTTTTTCT

1. 2H7 scFv with alternative VHL11 mutations:

Nucleotide sequence

20 Aagcttgccgccatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctc
tcccagctcagcaatcctgtctgcatctccaggggagaaggtcacaatgactgcagggccagctcaagtgaagttacatgcac
tggtaccagcagaagccaggatcctcccccacccctggatttatgcccacccaacctggcttctggagtcctgctcgttcagtg
ggcagtggtctgggacctctactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggag
ttaaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtgctgggcgggtggtggtatctggaggaggt
gggagctctcaggcttatctacagcagctctggggtgag (one of the following: tcn, acn, gan, can, aan,
25 **egn, agn**)
gtgaggcctggggcctcagtgaaatgtcctgcaaggcttctggctacacattaccagttacaatatgcactgggtaaagcagaca
cctagacagggcctggaatggattggagctatttatccaggaaatggtgatacttctacaatcagaagttcaagggaaggccac
actgactgtagacaaaatcctccagcacagcctacatgcagctcagcagcctgacatctgaagactctgcggtctatttctgtgcaag
30 agtggtgtactatagtaactcttactggtacttcgatgtctggggcacagggaccacgggtaccgtctcttctgatcag

30

Amino acid sequence

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSPGKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAE (one of the following:
35 **S, T, D, E, Q, N, R, K, H**)
VRPGASVKMSCKASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFK

WO 2005/017148

PCT/US2003/041600

GKATLTVDKSSSTAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVT
VSSDQ

2. VHL11 deletion

5 Nucleotide sequence:

Aagcttgcgcgatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctc
tccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttgcagggccagctcaagtgttaagttacatgcac
tggaccagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagt
ggcagtggtctgggacctctactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggag
10 ttaaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtgggtgagctggaggaggt
gggagctctcaggcttatctacagcagctctggggctgaggtgagggcctcagtgaaatgctcgaaggtctctggct
acacattaccagttacaatatgactgggtaaagcagacacctagacagggcctggaatgagtgagctattatccaggaaatg
gtgatacttctacaatcagaagttcaagggcaagggcacactgactgtagacaaatcctccagcagacgtacatgcagctcagc
agcctgacatctgaagactctgcggtctatttctgtgcaagagtggtgtactatagtaactcttactggacttcgatgtctggggcaca
15 gggaccacggtcaccgtctctctgatcag

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
20 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAEVRPGASVKMSCKA
SGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSST
AYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDQ

3. 2H7 VL L106 with alternative mutations

25 Nucleotide sequence:

aagcttgcgcgatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctc
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttgcagggccagctcaagtgttaagttacatgcact
ggaccagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagt
gcagtggtctgggacctctactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggatt
30 taaccacccacgttcggtgctgggaccaagctggag (tcn, agn, aan, cgn, can, gan, and non-natural
derivatives of these codons) aaagatggcgggtggctcggcggtgggtgagctggaggaggtgggagctc

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
35 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLE (S, T, R, K, H, Q, N, D, E, and non-natural derivatives of these
amino acids at position 106)KDGGGSGGGGSGGGGSS

4. VL L106 deletion

40 Nucleotide sequence:

Aagcttgcgcgatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctc
tccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttgcagggccagctcaagtgttaagttacatgcac
tggaccagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagt
ggcagtggtctgggacctctactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggag
45 ttaaccacccacgttcggtgctgggaccaagctggagaaagatggcgggtggctcggcggtgggtgagctggaggaggtgg
gagctc

Amino acid sequence:

WO 2005/017148

PCT/US2003/041600

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLEKDGGGSGGGGSGGGGSS

5 **5. IgE CH3 CH4**

Nucleotide sequence:

tccaacccgagaggggtgagcgccctacctaagccggccagcccgttcacctgttcacccgaagtcgcccacgatcacctgtc
tggtggtggacctggcaccagcaaggggaccgtgaacctgacctgggtccggccagtggaagcctgtgaacctccacc
agaaaggaggagaagcagcgcgaatggcacgttaacctgcacgtccacctgcccgtgggacccgagactggatcgaggggg
10 agacctaccagtgaggggtgacccacccccacctgcccagggccctcatgcgtccacgaccaagaccagcggcccgctgct
gccccggaagtctatgcgttgcgacggcgagtgccggggagccgggacaagcgacccctgcctgctgatccagaactt
catgctgaggacatctcgtgcagtggctgcacaacgaggtgcagtcctccggacgcccggcacagcagcagcagccccgc
aagaccaagggtccggcttctgttccagccgctggaggtgaccagggccgaatgggagcagaagatgagttcatctgcc
gtgcagtcctatgaggcagcgagccctcacagaccgtccagcgagcgggtgtctgtaaatcccggtaatgataatctagaa

15

Amino acid sequence:

SNPRGVSAYLSRPSPFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTR
KEEKQRNGTLTVTSTLPVGTRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAA
PEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRK
20 TKGSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGK

6. hIgG1H/IgE WCH3 WCH4

Nucleotide sequence:

tgatcaggagccccaatctctgacaaaactcacacatccccaccgtccccagcatccaacccgagaggggtgagcgccctaccta
25 agccggcccagcccgttcacctgttcacccgaagtcgcccacgatcacctgtctgggtggacctggcaccagcaagggg
acctgaacctgacctgggtccggccagtggaagcctgtgaacctccaccagaaaggaggagaagcagcgcgaatggca
cgttaacctgcacgtccacctgcccgtgggcacccgagactggatcgagggggagacctaccagtgacgggtgacccacccc
cacctgcccagggccctcatgcgtccacgaccaagaccagcggcccgctgctgccccggaagtctatgcgttgcgacgcc
ggagtgccggggagccgggacaagcgacccctgcctgctgatccagaactcatgctgaggacatctcgtgcagtggct
30 gcacaacgaggtgcagtcctccggacgcccggcacagcagcagcagcagccccgaagaccaagggtccggcttctcgtctca
gccgctggaggtgaccagggccgaatgggagcagaaagatgagttcatctgccgtgcagtcctatgaggcagcgagccctca
cagaccgtccagcgagcgggtgtctgtaaatcccggtaatgataatctagaa

Amino acid sequence:

DQEPKSSDKTHTSPPSPASNPRGVSAYLSRPSPFDLFIRKSPTITCLVVDLAPSKGTV
35 NLTWSRASGKPVNHSTRKEEKQRNGTLTVTSTLPVGTRDWIEGETYQCRVTHPHL
PRALMRSTTKTSGPRAAPEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLH
NEVQLPDARHSTTQPRKTKGSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQT
VQRAVSVNPGK

40

7. IgE WCH2 WCH3 WCH4

Nucleotide sequence:

Tgatcagctctgtccaggacttcacccgcccaccgtgaagatcttacagtcgtcctgcgacggcgccgggacacttcccccg
accatccagctcctgtgctcgtcttggtacacccagggactcaacatcacctggctggaggacgggcaggtcatggacg
45 tggactgtccaccgctctaccacgcaggaggggtgagctggcctccacaaagcgagtcacctcagccagaagcactggc
tgtcagaccgcacctacacctgccaggtcacctatcaaggtcacaccttgaggacagcaccagaaggtgtgcagattccaacc
gagaggggtgagcgccctacctaagccggcccagcccgttcacctgttcacccgaagtcgcccacgatcacctgtctgggtggtg
gacctggcaccagcaaggggaccgtgaacctgacctgggtccggccagtggaagcctgtgaacctccaccagaaagg
aggagaagcagcgcaatggcacgttaacctgcacgtccacctgcccgtgggcacccgagactggatcgagggggagacctta
ccagtgaggggtgaccacccccacctgcccagggccctcatgcgtccacgaccaagaccagcggcccgctgctgccccg
50 gaagtctatgcgttgcgacggcgagtgccggggagccgggacaagcgacccctgcctgctgatccagaactcatgct

WO 2005/017148

PCT/US2003/041600

gaggacatctcgggtgcagtggtgcacaacgaggtgcagctcccgagcggcgccacagcagcagcagcccgcaagacc
aagggtccggcttctcgtctcagccgcctggaggtgaccaggccgaatgggagcagaaagatgagttcatctgccgtgcag
tccatgaggcagcagccctcacagaccgtccagcgagcgggtgtctgtaaatcccggtaaatgataatctaga

5 Amino acid sequence:
DHVCSRDFTPPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDV
DLSTASTTQEGELASTQSELTLSQKHWLSDRTYTCQVTYQGHTFEDSTKKCADSN
PRGVSAAYLSRPSFDLFIKRSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKE
EKQRNGTLTVTSTLPVGTDRDIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPE
10 VYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTK
GSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGK

8. hIgG1H/IgE CH3 CH4 (ORF)

Nucleotide sequence:

15 tgatcaggagcccaaatctctgacaaaactcacacatccccaccgtccccagcatccaaccgagaggggtgagcgcclaccta
agccggcccgagcccggttcgacctgttcacccgaagtcgcccacgacacctgtctgggtggacctggcaccagcaagggg
accgtgaacctgacctggtcccgggccagtggaagcctgtgaaccactccaccagaaaggaggagaagcagcgcaatggca
cgtaaccgtcacgtccacctgcccgtgggacccgagactggatcgagggggagacctaccagtgcagggtgacctacccc
cacctgcccaggggccctcatgctccacgaccaagaccagcggcccgctgtctgccccggaagtctatgctgttcgacgcc
20 ggagtgccggggagccgggacaagcgcacctcgcctgcctgatccagaacttcacctgaggacatctcgtgcagtggt
gcacaacgaggtgcagctcccgagcggcgccacagcagcagcagcagcccgcaagaccaagggctccgcttctcgtctca
gcccctggaggtgaccaggccgaatgggagcagaaagatgagttcatctgccgtgcagtcctgaggcagcagccctca
cagaccgtccagcgagcgggtgtctgtaaatcccggtaaagcgatccttcgaa

25 Amino acid sequence:
DQEPKSSDKTHTSPSPASNPRGVSAAYLSRPSFDLFIKRSPTITCLVVDLAPSKGTV
NLTWSRASGKPVNHSTRKEEKQRNGTLTVTSTLPVGTDRDIEGETYQCRVTHPHL
PRALMRSTTKTSGPRAAPEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLH
NEVQLPDARHSTTQPRKTKGSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQT
30 VQRAVSVNPGKSGSFE

9. 2H7 VHL11S scFv hIgG1(SSS-S)H hIgE WCH3 WCH4

Nucleotide sequence:

35 aagcttcccgcattgatttcaagtgcagatttcagcttctcctgctaatcagtgcttcagtcataattgccagaggacaaattgtctct
cccagctccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgttaagtacatgcact
ggtaccagcagaagccaggatctccccaaacctggatttatccccatcaacctggcttctggagtcctcgtcgttcagtg
gcagtggtgtctgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgaggtt
taaccacccacgttcgggtgctgggaccaagctggagctgaagatggcgggtgctcggcggtgtggatctggaggaggtg
ggagctctcaggcttatctacagcagctctggggctgagtcggtgaggcctggggcctcagtgaaagatgctcgaaggcttctggc
40 tacacattaccagttacaatatgcactgggtaaagcagacacctagacagggcctggaatggattggagctatttatccaggaat
ggtgatacttctacaatcagaagttaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggcttattctgtgcaagagtgggtgactatagtaacttactggctactcagatgctggggc
agggaccacggtcaccgtctctctgatcaggagcccaatctctgacaaaactcacacatccccaccgtcctcagcatccaacc
cgagaggggtgagcgcctacctaagccggccagccggttcgacctgttcacccaagtcgccacagatcacctgtctgggtgt
45 ggacctggcaccagcaaggggaccgtgaacctgacctggctccggggcagtggaagcctgtgaacctccaccagaag
gaggagaagcagcgcaatggcacgttaaccgtcacgtccacctgccgggtgggcacccgagactggatcagggggagacct
accagtgcagggtgaccaccccccacctgccaggggccctcatgctggtccacgaccaagaccagcggcccgctgctgcccc
ggaagtctatgctgttcgacgcccggagtgccggggagccgggacaagcgcacctcgcctgctgatccagaacttcagtc
tgaggacatctcgggtgcagtggtgcacaacgaggtgcagctcccgagcggcgccacagcagcagcagcccgcaagacc
50 aagggtccggcttctcgtctcagccgcctggaggtgaccaggccgaatgggagcagaaagatgagttcatctgccgtgcag
tccatgaggcagcagccctcacagaccgtccagcgagcgggtgtctgtaaatcccggtaaatgataatctaga

WO 2005/017148

PCT/US2003/041600

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 5 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
 TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
 THTSPSSASNPRGVSAYLSRPSFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASG
 KPVNHSTRKEEKQRNGTLTVTSTLPVGTTRDWIEGETYQCRVTHPHLPRALMRSTT
 10 KTSGPRAAPEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDAR
 HSTTQPRKTKGSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNP
 GK

10. 2H7 VHL11S scFv hIgG1(SSS-P)H hIgE WCH3 WCH4

15

Nucleotide sequence:

aagcttgcgccatggaatttcaagtcagatttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
 cccagctctccagcaatcctgtctgcatctccaggggagaggtcacaatgacttgcagggccagctcaagtgttaattacatgcact
 ggtaccagcagaagccaggatcctccccaacccctggatttatcccccacccaacccctggcttctggagtcctgctcgttcagtg
 20 gcagtgggtctgggacctctactctctcacaatcagcagagtgagggtgaagatgctgccattacttactgccagcagtgagggtt
 taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtggtggatctggaggaggtg
 ggagctctcaggcttatctacagcagcttggggctgagtcggtgaggcctggggcctcagtgaaatgctctgcaaggcttctggc
 tacacatttaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctatttatccaggaaat
 ggtgatacttctcacaatcagaagttcaaggcgaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
 25 cagcctgacatctgaagactctgcggtctatttctgtgcaagagtggtgactatagtaactcttactggctactcagtgctggggcac
 agggaccacggtcaccgtctcttctgatcaggagcccaatcttctgacaaaactcacacatccccaccgtccccagcatccaacc
 cgagagggggtgagcgctacctaagccggccagcccggttcgacctgttcacccgaagtcgccacgatcacctgtctgggtggt
 ggacctggcaccagcaaggggaccgtgaacctgacctggtccgggagcagtggaagcctgtgaaccactccaccagaaag
 gaggagaagcagcgcaatggcacgttaacctgcacgtccacctgcccgtgggacccgagactggatcgagggggagacct
 30 accagtgcagggtgacctaccccccacctgcccaggccctcatgctgggtccacgaccaagaccagcggcccgctgctgcccc
 ggaagtctatgcgttgcgacgccggagtgccggggagccgggacaaagcgcaccctcgctgctgatccagaacttcatgcc
 tgaggacatctcgggtgagtggtgcacaacgaggtgcagctccggacggcgccgacagcacgacgcagccccgaagacc
 aagggtcccgcttctctctcagccgctggaggtgaccaggccgaatgggagcagaagatgagttcatctgccgtgcag
 tccatgaggcagcgagccctcacagaccgtccagcgagcgggtgtctgtaaatcccggttaaatgataatctaga

35

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 40 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
 TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
 THTSPSPASNPRGVSAYLSRPSFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASG
 KPVNHSTRKEEKQRNGTLTVTSTLPVGTTRDWIEGETYQCRVTHPHLPRALMRSTT
 KTSGPRAAPEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDAR
 45 HSTTQPRKTKGSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNP
 GK

10. 2H7 VL L106S

aagcttgcgccatggaatttcaagtcagatttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
 50 cccagctctccagcaatcctgtctgcatctccaggggagaggtcacaatgacttgcagggccagctcaagtgttaattacatgcact
 ggtaccagcagaagccaggatcctccccaacccctggatttatcccccacccaacccctggcttctggagtcctgctcgttcagtg

WO 2005/017148

PCT/US2003/041600

gcagtgggtctgggacctcttactcttcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtgaggattt
taaccacccacggtcgggtctgggaccaagctggagctgaaagatggcgggtggctcggcggtggtggaatctggaggaggtg
ggagctc

5 Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLESKDGGGSGGGGSGGGGSS

10 11. 2H7 VL L106S scFv

Nucleotide sequence:

aaagcttggcccatgatttcaagtgcagatttcagcttctgtaatacagtgcttcagtcataattgccagaggacaaattgttctc
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgaattacatgcact
gggtaccagcagaagccaggatcctccccaaccctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagtg
15 gcagtgggtctgggaccttactcttcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtgaggattt
taaccacccacggtcgggtctgggaccaagctggagcttaagatggcgggtggctcggcggtggtggaatctggaggaggtg
ggagctctcaggttatctacagcagctctggggctgagctggtgaggcctggggcctcagtgaaatgctcctgaaggcttctggc
tacacattaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
gggtgatacttctacaatcagaagtcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
20 cagcctgacatctgaagactctgcggcttattctgtgcaagagtgggtgactatagtaactcttactgggtacttcgatgtctggggc
agggaccacgggtcaccgtctcttctgatcag

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
25 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLESKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTTVTVSSDQ

30 12. 2H7 scFv VL L106S VHL11S scFv

Nucleotide sequence:

Aagcttggcccatgatttcaagtgcagatttcagcttctgtaatacagtgcttcagtcataattgccagaggacaaattgttctc
tccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgaattacatgcac
tggtaccagcagaagccaggatcctccccaaccctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagtg
35 ggcagtggtctgggaccttactcttcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtgaggatt
ttaaccacccacggtcgggtctgggaccaagctggagcttaagatggcgggtggctcggcggtggtggaatctggaggaggt
gggagctctcaggttatctacagcagctctggggctgagctcggtgaggcctggggcctcagtgaaatgctcctgaaggcttctg
gctacacattaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaa
atgggtgatacttctacaatcagaagtcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctc
40 agcagcctgacatctgaagactctgcggcttattctgtgcaagagtgggtgactatagtaactcttactgggtacttcgatgtctggggc
acagggaccacgggtcaccgtctcttctgatcag

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
45 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLESKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTTVTVSSDQ

50 10. Human IgD hinge linker with attached restriction sites

Nucleotide:

WO 2005/017148

PCT/US2003/041600

gtggatccaggttcgaagtctccaaaggcacaggcctcctccgtgccactgcacaacccccagcagagggcagcctcgccaa
ggcaaccacagccccagccaccaccgtaacacaggaagaggaggagaagagaagaagaaggagaaggagaagaggaa
caagaagagagagacaaagaccggcgagtcgacg

5 Amino acid:
VDPGSKSPKAQASSVPTAQPQAEGSLAKATTAPATTRNTGRGGEEKKKKEKEKEEQ
EERETKTGAVD

Sequence of Native IgD hinge domain:

10 (includes a cysteine residue—we truncated the hinge prior to that residue for these
constructs:)

Nucleotide:

gagtcctccaaaggcacaggcctcctccgtgccactgcacaacccccagcagagggcagcctcgccaaaggcaaccacagccc
cagccaccaccgtaacacaggaagaggaggagaagagaagaagaaggagaaggagaagaggacaagaagagagaga
15 gacaaagacaccagagtgtccgagccacaccagcctcttgccgctctacctgctaaccct

Amino acid sequence:

ESPKAQASSVPTAQPQAEGSLAKATTAPATTRNTGRGGEEKKKKEKEKEEQEERET
KTPECPSHTQPLGVYLLTP

20

12. 2H7 VH L11S

Nucleotide sequence:

caggcttatctacagcagtcctggggctgagtcggtagggcctggggcctcagtgaaatgtcctgcaaggctctggtacacattt
accagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctattatccaggaaatggatgact
25 tctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcagcagcctga
catctgaagactctgcggtctattctgtgcaagagtgggtactatagtaactcttactggctcctgatgtctggggcacaggagacc
acggtcaccgtctctct

Amino acid sequence:

30 QAYLQQSGAESVRPGASVKMSCKASGYTFTSYNMHWVKQTPRQGLEWIGATYPG
NGDTSYNQFKGKATLTVDKSSSTAYMQLSSLTSEDSAVYFCARVVYYNSYWY
FDVWGTGTTVTVSS

13. 2H7 VH L11S scFv

35 Nucleotide sequence:

aagcttccgccatggatttcaagtcagatttcagcttctgctaatacagtcgttcagtcataattgccagaggacaaattgtctct
cccagctcagcaatcctgtctgcactcaggggagaaggtcacaatgacttcagggccagctcaagtgaattacatgcact
ggtaccagcagaagccaggtcctccccaacccctggatttatcccatccaacctggctctggagtcctgctcgttcagtg
gcagtggtgtctgggacctcttactctcacaatcagcagagtgagggtgaagatgtgccacttattactgccagcagtgagatt
40 taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcggctggctcggcggtggtgatctggaggagtg
ggagctctcaggcttatctacagcagtcctgggctgagtcggtgaggcctggggcctcagtgaaatgtcctgcaaggctctggtc
tacacattaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctattatccaggaaat
gggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctattctgtgcaagagtgggtactatagtaactcttactggctactgatgtctggggcac
45 agggaccacggtcaccgtctctctgatcag

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
50 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK

PCT/US2003/041600

WO 2005/017148

PCT/US2003/041600

agaagtgtgcagattccaacccgagaggggtgagcgctacctaagccggcccagcccgttcacgtgttccgcaagtcgc
ccacgatcacctgtctgggtggacctggcaccagcaaggggaccgtgaacctgacctgggtccggggccagtgggaagcct
gtgaaccactccaccagaaaggaggagaagcagcgcaatggcacgtaaacgtcacgtccaccctgccgggtgggcacccgag
actggatcgagggggagacctaccagtgcaggggtgaccacccccacctgcccagggccctcatgagggtccacgaccaagac
5 cagcgcccccgcgtgctgccccggaagtctatgcgtttgcgacgcccggagtgccgggggagccgggacaaagcgcaccctcgcc
tgctgatccagaacttcatgcctgaggacatctcgggtgagtggtgcacaacgaggtgcagctcccgacgcccggcacagc
acgacgcagccccgcaagaccaagggtccggcttctctgctctcagccgctggaggtgaccagggccgaatgggagcagaa
agatgagttcatctgcccgtgcagtcctatgaggcagcgagccctcacagaccgtccagcgagcggtgtctgtaaatcccggtaaa
tgataatctaga

10

Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
15 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTTVTVSSDHVCSRDF
PPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTASTTQ
EGELASTQSELTLSQKHWSLDRITYTCQVTYQGHTFEDSTKKCADSNPRGVSAYLS
RPSFDLFIKRSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNGTLT
20 VTSTLPVGTDRDIEGETYQCRVTHPLRALMRSTTKTSGPRAAPEVYAFATPEW
PGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKGSGFFVFSRL
EVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGK

16. 2H7 scFv VH L11S mIgE WCH2 WCH3 WCH4

25 Nucleotide sequence:

aagcttgcgccatggatttcaagtgcagatttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagctccagcaatcctgtctgcatctccaggggagaaggtcacatgactgcagggccagctcaagtgaagtacatgcact
ggtagcagcagaagccaggtacctccccaaacctggattatgccccatcaacctggctctgagtcctctgctcctcagtg
gcagtggtctgggacctcttactcttcacaatcagcagagtgaggagctgaagatgctgccattattactgccagcagtgaggtt
30 taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtgggtgagctggaggagtg
ggagctctcaggttatctacagcagctggggctgagctgtgaggcctggggcctcagtgaaagatgctctgcaaggcttctggct
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gtgatacttctacaatcagaagttcaagggaagggcacactgactgtagacaaatctccagcacagcctacatgcagctcagc
agcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtgactatagtaactcttactggtacttcgatgtctggggcaca
35 gggaccacggtcaccgtctctctgatcaggttcgacctgtcaacatcactgagcccaccttgagctactccattcatcctgcgacc
ccaatgcattccactccaccatccagctgtactgtcttattatggccacatcctaataatgatgtctctgtcagctggtaatggacgatc
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gatcatgagccacggggtgtgattacctacctgatccaccagccccctggacctgtatcaaaacgggtgtcccaagcttacctgt
40 ctggtggtggacctggaaagcgagaagaatgtcaatgtgacgtggaaccaagagaagaagacttcagctcagcatccagtggt
acactaagcaccacaataacgccacaactagatcacctccatctgcctgtagttgccaaggactggattgaaggctacggctatc
agtgcatagtggaccacctgatttcccaagccattgtgcgttccatcaccaagacccccagggcagcgtcagccccgaggtat
tatgtgttccaccaccagaggaggagagcgaggacaaacgcacactcacctgtttgatccagaactcttccctgaggatattct
gtgcagtggtgggggatggcaactgatctcaaacgccagcagcagtagccacaacacccctgaaatccaatggctccaatcaa
45 ggcttcttcatcttcagtcgcttagaggtcgccaagacactctggacacagagaaaacagttcacctgccaagtgtccatgaggc
acttcagaaaccaggaaactggagaaaacaatatccacaagccttggtaacacctccctccgtccatcctagtaatactagag

Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
50 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK

WO 2005/017148

PCT/US2003/041600

ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDHVRPVNIT
EPTLELLHSSCDPNAFHSTIQLYCFIYGHILNDVSVSWLMDDREITDTLAQTVLIKE
EGKLASTCSKLNITEQQWMSESTFTCKVTSQGVVDYLAHTRRCPDHEPRGVITYLIP
5 PSPLDLYQNGAPKLTCLVVDLESEKNVNVVTWNQEKKTSVSASQWYTKHHNNATT
SITSILPVVAKDWIEGYGYQCIVDHPDFPKPIVRSITKTPGQRSAPENVYVFPPEESEE
DKRTLTLCLIQNFFPEDISVQWLGDGKLISNSQHSTTTPLKSNQSNQGFIFSRLEVAK
TLWTQRKQFTCQVIHEALQKPRKLEKTISTSLGNTSLRPS

10 **17. 2H7 scFv VH L11S hIgA WH WCH2 T4CH3**

Nucleotide sequence:

aagcttgcgcgcattgatttcaagtcagatttcagcttctgctaatacagtcgttcagtcataattgccagaggacaaaattgttctct
cccagctccagcaatcctgtctgcatctccaggggagaaaggtcacatgacttcagggccagctcaagtgtaagttacatgcact
ggtaccagcagaagccaggatcctcccccacccctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagtg
15 gcagtggtctgggaccttactctctcacaatcagcagagtgaggagctgaagatgctgccacttattactgccagcagtgagattt
taaccacccacggtcgggtgctgggaccaagctggagctgaaagatggcgggtgctcgggcgggtggtgatctggaggagtg
ggagctctcaggcttatctacagcagctctggggctgagctctgtagggcctggggcctcagtgaaagatgctctgcaaggcttctggct
acacattaccagttacaatatgcactgggtaaagcagacacctagacagggcctggaatggattggagctatttatccaggaaatg
gtgatacttctacaatcagaagttcaagggaagccacactgactgtagacaaatcctccagcacagcctacatgcagctcagc
20 agcctgacatctgaagactctgcggctctatttctgtgcaagagtggtgactatagtaactcttactgtacttcgatgtctggggcaca
gggaccacggtcaccgtctctctgatcagccagttccctcaactccacctacccatctccctcaactccacctacccatctccct
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acctctgtggtgctacagcgtgtccagigtctgcgggctgtgccagccatggaacctgggaagaccttcacttgcactgct
25 gcttaccggagtcgaagaccccgctaaccgccacctctcaaaatccggaaacacattccggcccagggtccacctgctgccg
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ccaccttcgctgtgaccagcactgctgcgtggcagccgaggactggaagaagggggacaccttctctgcatggtggggccacg
aggccctgccgctggccttcacacagaagaccatcgaccgcttggcgggtaaacccaccatgtcaatgtgtctgttgcacgtggcg
30 gaggtgactgataatctaga

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYIAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
35 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQVPVSTPPT
PSPSTPPTPSPSCCHPRLSLHRPALEDLLLGSEAILTCTLTGLRDASGVITFTWTPSSG
KSAVQGGPPDRDLGCGYSVSSVLPGCAEPWNHKGKTFCTAAYPESKTPLTATLSKS
40 GNTFRPEVHLLPPPSEELALNELVTLTCLARGFSPKDVLRWLQGSQELPREKYLT
WASRQEPSQGTTFFAVTSILRVAEDWKKGDTFSCMVGHEALPLAFTQKTIDRLA
GKPTHVNVSVVMAEVD

45 **18. 2H7 scFv VH L11S mIgA WH WCH2 T4 CH3**

Nucleotide sequence:

aagcttgcgcgcattgatttcaagtcagatttcagcttctgctaatacagtcgttcagtcataattgccagaggacaaaattgttctct
cccagctccagcaatcctgtctgcatctccaggggagaaaggtcacatgacttcagggccagctcaagtgtaagttacatgcact
ggtaccagcagaagccaggatcctcccccacccctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagtg
50 gcagtggtctgggaccttactctctcacaatcagcagagtgaggagctgaagatgctgccacttattactgccagcagtgagattt
taaccacccacggtcgggtgctgggaccaagctggagctgaaagatggcgggtggctcgggcgggtggtgatctggaggaggtg
ggagctctcaggcttatctacagcagctctggggctgagctctgtagggcctggggcctcagtgaaagatgctctgcaaggcttctggct

WO 2005/017148

PCT/US2003/041600

acacatttaccagttacaatatgcactgggtaaagcagacacctagacaggcctggaatggattggagctatttatccaggaaatg
gtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcagacgctacatgcagctcagc
agcctgacatctgaagactctcggtctatttctgtgcaagagtgggtactatagtaactcttactggtactctgatgtctggggcaca
gggaccacggtcaccgtctctctgatcacatctgttctcctactactcctcctccaccttctgccagcccagcctgtcactgca
5 gcgccagctcttgaggacgtctcctgggttcagatgccagcatcacatgtactctgaatggcctgagagatcctgagggagctg
tcttcacctgggagccctccactgggaaggatgcagtgacagaagaagctgtgcagaattcctcggtctgacagtgtgtccagc
gtcctgcctggctgtgtgagcgtggaacagtggcgcatcattcaagtgcacagttaccatcctgagctgtacaccttaactggc
acaattgccaaagtcacagtgaacaccttcccaccccaggtccacctgtaccgccgccgtcgaggagctggccctgaatgag
ctcgtgtccctgacatgctgtgagcgtttcaaccctaaagaagtgtggtgcgatggctgcaggaatgaggagctgtcccc
10 agaaagctacctagtgtttgagcccctaaaggagccagggcagggagccaccacctacctggtgacaagcgtgtgctgtatca
gctgaaatctggaacagggtgaccagtactcctgcagtggtggccacgaggccttgcccatgaacttcaccacagaagaccatcg
accgtctgtcgggtaaaccaccaatgtcagcgtgtctgtgatcatgtcagaggagattgataatctagat

Amino acid sequence:

15 MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDHICSPPTTP
20 PPPSCQPSLSLQRPALDLLLLGSDASITCTLNGLRDPEGAVFTWEPSTGKDAVQKK
AVQNSCGCYSVSSVLPGCAERWNSGASFKCTVTHPESDTLTGTLAKVTVNTFPPQV
HLLPPPSEELALNELVSLTCLVRAFNPKEVLVRWLHGNEELSPESYLVEPLKEPGE
GATTYLVTSVLRVSAEIWKQGDQYSCMVGHEALPMNFTQKTIDRLSGKPTNVSVS
VIMSEGD

25

A. mIgA WCH2 T4CH3

Nucleotide sequence:

Gttgtgatcacatctgttctcctactactcctcctccaccttctgccagcccagcctgtcactgcagcggccagctcttgagga
cctgtcctctgggttcagatgccagcatcacatgtactctgaatggcctgagagatcctgagggagctgtcttcacctgggagccctc
30 cactgggaaggatgcagtgacagaagaagctgtgcagaattcctcggtctgtacagtgtgtccagcgtcctgcctgctgtgtg
agcgtctggaacagtggcgcatcattcaagtgcacagttaccatcctgagctgtacaccttaactggcacaattgccaaagtcaca
gtgaacaccttcccaccccaggtccacctgtaccgccgccgtcgaggagctggccctgaatgagctcgtgtccctgacatgcc
tggtgcgagctttcaaccctaaagaagtgtgctgtgcgatggctgcaggaatgaggagctgtccccagaaagctacctagtgtttg
agcccctaaaggagccagggcagggagccaccacctacctggtgacaagcgtgtgtcgtgtatcagctgaaatctggaacagg
35 gtgaccagtactcctgcagtggtggccacgaggccttgcccatgaacttcaccacagaagaccatcgaccgtctgtcgggtaaac
caccaatgtcagcgtgtctgtgatcatgtcagaggagattgataatctagat

Amino acid sequence:

40 DHICSPPTTPPPSCQPSLSLQRPALDLLLLGSDASITCTLNGLRDPEGAVFTWEPST
GKDAVQKKAVQNSCGCYSVSSVLPGCAERWNSGASFKCTVTHPESDTLTGTLAKV
TVNTFPPQVHLLPPPSEELALNELVSLTCLVRAFNPKEVLVRWLHGNEELSPESYL
VFEPLKEPGE GATTYLVTSVLRVSAEIWKQGDQYSCMVGHEALPMNFTQKTIDRL
SGKPTNVSVSVIMSEGD

45 20. K322S CH2 region

Nucleotide sequence:

cctgaactcctgggggaccgtcagttcttcttccccccaaacccaaggacacctcatgatctcccggaccctcagggtcac
atgcgtgggtggagctgagccacgaagacctgaggtcaagttaactgggtacgtggagggcgtggaggtgcataatgcaa
gacaaagccgcgggaggagcagtaacagcacgtaccgtgtgtgcagcgtcctaccgtcctgcaccaggactggctgaatg
50 gcaaggagtacaagtgtcgtcgtcctcaacaaagccctccagccccatcgagaaaacaatctccaaagccaaa

WO 2005/017148

PCT/US2003/041600

Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCSVSNKALPAPIEKTISKAK

5

21. K322S CH2 WCH3

Nucleotide sequence:

cctgaactcctgggggaccgtcagtccttcttcccccaaaacccaaggacaccctcatgatctccggaccctgaggtcac
atgctggtggtggacgtgagccacgaagaccctgaggtcaagttcaactgtacgtggacggcgtggaggtgcataatgccaa
10 gacaaagccgcgggaggagcagtacaacagcacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctgaatg
gcaaggagtacaagtgtcgtcgtcctcaacaaagccctccagccccatcgagaaaacaatctcaagccaaagggcagccc
cgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaagg
cttctatccagcgacatcgccgtggagtgaggagcaatgggcagccggagaacaactacaagaccacgcctcccggtgtg
actccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtg
15 atgcatgaggtctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCSVSNKALPAPIEKTISKAKG
20 QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPPV
LDSGDSFFLYSKLTVDKSRWQQGNVFSVSMHEALHNHYTQKSLSLSPGK

1. K322L CH2 WCH3

Nucleotide sequence:

tgatcaggagcccaaatctctgacaaaactcacacatccccaccgtcctcagcacctgaactcctggggggaccgtcagtccttct
cttcccccaaaacccaaggacaccctcatgatctccggaccctgaggtcacatgctggtggtggacgtgagccacgaaga
ccctgaggtcaagttcaactgtgtacgtggacggcgtggaggtgcataatgccaagacaaagccgcgggaggagcagtacaaca
gcacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggagtacaagtgcctggtctccaaca
agccctccagcctccatcgagaaaacaatctcaaaagccaaaggcagccccgagaaccacaggtgtacacctgccccat
30 cccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaaggcttctatccagcgacatcgccgtgagtggtg
agagcaatgggcagccggagaacaactacaagaccacgcctcccggtgtgactccgacggctccttctctctacagcaagct
caccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgaggtctgcacaaccactacacgca
gaagagcctctcctgtctccgggtaaatgatctaga

35 Amino acid sequence:

DQEPKSSDKTHTSPPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHED
PEVKFNWYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCLV
SNKALPAPIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVE
WESNGQPENNYKTPPVLDSDGDSFFLYSKLTVDKSRWQQGNVFSVSMHEALHN
40 HYTQKSLSLSPGK

22. 2H7 scFv VHL11S hIgG1 (SSS-S)H K322SCH2 WCH3

Nucleotide sequence:

aagcttgccgcatgatttcaagtcagatttcaagtccttctgtaatacagtgcttcagtcataattgccagaggacaaattgttctt
45 cccagctctccagcaatcctgtctgcatctccaggggagaaggtcacatgactgcagggccagctcaagtgttaattacatgcact
ggtaccagcagaagccaggatcctccccaaacctgatttatccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtggtgtggaccttactctctcacaatcagcagagtgaggctgaagatgctgccactattactgccagcagtgaggtt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctggcggtggtgagctggaggaggtg
ggagctctcaggcttatctacagcagctggggctgagtcggtgaggcctggggcctcagtgaaagatgctcgaaggcttctggc
50 tacacatttaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
ggtgatacttctacaatcagaaggtcaagggaaggccacactgactgtagacaaatcctccagcacagcctcatgacagtcag

WO 2005/017148

PCT/US2003/041600

cagcctgacatctgaagactctcggtctatttctgtgcaagagtgggtactatagtaactcttactggacttcgatgtctggggcac
agggaccacgggtaccgtctctctgatcaggagcccaaatctctgacaaaactcacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttctctctcccccaaaacccaaggacaccctcatgatctcccggaccctgaggtcacatgcgtgg
tggtggacgtgagccacgaagaccctgaggtcaagttaactggtagctggacggcgtggaggtgcataatgccaagacaaagc
5 cgcgggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
tacaagtgtcgggtctccaacaagccctcccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaacca
caggtgtacaccctgccccatcccgggatgagctgaccaagaaccagggtcagcctgacctgctggtcaaggcttctatcca
gcgacatcgccgtggagtgggagagcaatgggcagccggagaaactacaagaccacgcctcccgtgtgactccgacgg
ctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcagggggaacgtcttctcatgctccgtgatgatgagg
10 cttgcacaaccactacacgcagaagagccctcctctgtcctgggtaaatgatctaga

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWIYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
15 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCSVSNKALPAPIE
20 KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFCSSVMHEALHNHYTQKSLSLS
PGK

23. 2H7 scFv VHL11S hIgG1 (SSS-S)H K322LCH2 WCH3

Nucleotide sequence:

aagcttgccgcatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgtctct
cccagctcctcagcaatcctgtctgcatctccaggggagaaggtcacaatgactgcagggccagctcaagtgaattacatgcact
ggtagcagcagaagccaggtacctccccaaacctggattatgccccatccaacctggcttctggagtcctgtctgcttcagtg
30 gcagtgggtctgggacctcttactctctcacaatcagcagagtggaggtggaagatgctgcccatttactgccagcagtgaggatt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtgggtgagctggaggaggtg
ggagctctcaggcttatctacagcagctggggctgagtcggtgaggcctggggcctcagtgaaagatgctctgaaggcttctggc
tacacattaccagttacaatatgactgggtaaagcagacacctagacagggcctggaatggattggagctattatccaggaaat
ggtagacttctcacaatcagaagtcaagggaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
35 cagcctgacatctgaagactctcggtctatttctgtgcaagagtgggtactatagtaactcttactggtagcttcgatgtctggggcac
agggaccacgggtaccgtctctctgatcaggagcccaaatctctgacaaaactcacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttctctctcccccaaaacccaaggacaccctcatgatctcccggaccctgaggtcacatgcgtgg
tggtggacgtgagccacgaagaccctgaggtcaagttaactggtagctggacggcgtggaggtgcataatgccaagacaaagc
cgcgaggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
40 tacaagtgcctggtctccaacaagccctcccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaacca
caggtgtacaccctgccccatcccgggatgagctgaccaagaaccagggtcagcctgacctgctggtcaaggcttctatcca
gcgacatcgccgtggagtgggagagcaatgggcagccggagaaactacaagaccacgcctcccgtgtgactccgacgg
ctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcagggggaacgtcttctcatgctccgtgatgatgagg
ctctgcacaaccactacacgcagaagagccctcctctgtcctgggtaaatgatctaga
45

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWIYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
50 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK

WO 2005/017148

PCT/US2003/041600

THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCLVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVSCSVMHEALHNHYTQKSLSLS
5 PGK

24. 2H7 scFv VHL11S hIgG1 (CSS-S)H K322SCH2 WCH3

Nucleotide sequence:

aagcttgcgcgcattgatttcaagtgcagatttgcagttctcgtctaatcagtgcttcagtcataattgccagaggacaaattgttctct
10 cccagctccagcaatcctgtctgcatctccaggggagaaggtcacatgacttcagggccagctcaagtgaagtacatgcact
ggtaccagcagaagccaggtaccccccacccctggattatgccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtggtctgggacctcttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgaggtt
taacccaccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcgggcgggtggtgagctggaggaggtg
ggagctctcaggttatctacagcagctggggctgagtcggtagggcctgggcctcagtgagatgctctgcaaggcttctggc
15 tacacattaccagttacaatgactgggtaaagcagacacccatagacagggcctggaatggattggagctattatccaggaaat
ggtgatacttctcacaatcagaagtcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctattctgtgcaagagtggtgactatagtaactcttactggtacttcagatgctcgggcac
agggaccacgggtcaccgtctctctgatcaggagcccaaatctgtgacaaaactcacacatccccaccgtcctcagcacctgaact
cctgggggggaccgtcagttctctcttccccccaaaacccaaggacacccctcatgatctcccggacccctgaggtcacatgcgtgg
20 tggtaggacgtgagccacgaagaccctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgccagacaagc
cgcgaggagcagtagacaacagcagcgtaccgtgtgtgcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
tacaagtgtcgtctccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaacca
caggtgtacaccctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaggcttctatcca
gcgacatcgccgtggagtgaggagcaatgggcagccggagaacaactacaagaccacgcctcccggtgctggactccgacgg
25 ctctctctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctccgtgatgcatgagg
ctctgcacaaccactacacgcagaagagcctctccctgctccgggtaaatgatctaga

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
30 QQKPGSSPKPWYIAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYNSYWFYFDVWGTGTTVTVSSDQEPKSCDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
35 DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCSVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVSCSVMHEALHNHYTQKSLSLS
PGK

40 25. P331S CH2

Nucleotide sequence:

cctgaactcctggggggaccgtcagttctctcttccccccaaaacccaaggacacccctcatgatctcccggaccctgaggtcac
atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgcaa
gacaaagccggggaggagcagtagacaacagcagcgtaccgtgtgtgcagcgtcctcaccgtcctgcaccaggactggctgaatg
45 gcaaggagtacaagtgcaaggtctccaacaaagccctcccagcctccatcgagaaaacaatctccaaagccaaa

Amino acid sequence

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPASIEKTISKAK
50

26. P331S CH2 WCH3

WO 2005/017148

PCT/US2003/041600

Nucleotide sequence:

cctgaactcctgggggaccgtcagttctcttctcccccaaaacccaaggacaccctcatgatctcccgacccctgaggtcac
atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttaactggtacgtggacggcggtggaggtgcataatgcaa
gacaaagccgcgggaggagcagtacaacagcagctaccgtgtgtgcagcgtcctaccgtcctgcaccaggactggctgaatg
5 gcaaggagtacaagtgcgaaggtctccaacaagccctccagcctccatcgagaaaacaatctcaaagccaaagggcagccc
cgagaaccacaggtgtacaccctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgacctggtcaaagg
cttctatcccagcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctgg
actccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtg
atgcatgaggtctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

10

Amino acid sequence

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPASIEKTISKAKG
QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPPV
15 LDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

27. 2H7 scFv VH L11S (SSS-S)H P331S CH2 WCH3

Nucleotide sequence:

aagcttgcgcctatgatttcaagtgcagatttctcagcttctgctaatcagtgcttcagtcataattgccagaggacaaattgtctct
20 cccagctcctcagcaatcctgtctgcatctccaggggagaagggtcacaatgacttcagggccagctcaagtgttaattacatgcact
ggtaccagcagaagccaggtatcctcccccacccctggaattatgccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtggtgtctgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgagttt
taaccaccaccagttcgggtgtgggaccaagctggagctgaaagatggcgggtggctcgggcgggtggatctggaggaggtg
ggagctctcaggcttatctacagcagcttggggctgagtcgggtgaggcctggggcctcagtgaaagatgctcgaagccttctggc
25 tacacatttaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
gggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtggtgtactatagtaactcttactggtacttcgatgtctggggcac
agggaccacggtcaccgtctctctgtatcagagagcccaatcttctgacaaactcacatcccaccgtctcagcacctgaact
cctgggggggaccgtcagttctcttctcccccaaaacccaaggacacctcatgatctcccgacccctgaggtcacatgcgtgg
30 tgggtgacgtgagccacgaagaccctgaggtcaagttcaactgggtacgtggacggcgtggaggtgcataatgccaaagacaagc
cgcgaggaggagcagtacaacagcacgtaccgtgtgtgcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
tacaagtgaaggtctccaacaagccctccagcctccatcgagaaaacaatctcaaagccaaagggcagccccgagaacca
caggtgtacacctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaaggcttctatccca
gcgacatcgccgtggagtgaggagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgacgg
35 ctcttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgagg
ctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

40

Amino acid sequence

MDFQVQIFSFLISASVIIARGQIVLSQSPAILASPGKEKVTMTCRASSSVSYMHWY
40 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYNSYWFYFDVWGTGTTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
45 DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPASIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPN
NYKTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLS
PGK

50

28. 2H7 scFv VH L11S (CSS-S)H P331S CH2 WCH3

WO 2005/017148

PCT/US2003/041600

Nucleotide sequence:

aagcttgccgccatggatttcaagtcagattttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgtctct
cccagctctccagcaatctgtctgcatctccaggggagaaggtcacatgactgcagggccagctcaagtgtaagtacatgcact
ggtaccagcagaagccaggatcctccccaaacctggalltatgccccatccaacctggcttctggagtcctgctcgttcagtg
5 gcagtggtgctgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgagttt
taaccacccacgttcgggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtggtggatctggaggagtg
ggagctctcaggcttactacagcagctggggctgagtcggtgagggcctggggcctcagtgaaagatgctcgaaggcttctggc
tacacattaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctatttatccaggaaat
ggtgatacttctacaatcagaagttcaagggcaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
10 cagcctgacatctgaagactctgcggtctatttctgtcgaagagtggtgactatagtaacttactggtacttcgatctctgggcac
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cgcgaggaggagcagtagaacagcagtagcctgtggtcagcgtcctaccgtcctgcaccaggactggctgaatggcaaggag
15 tacaagtgcgaaggtctccaacaagccctccagcctccatcgagaaaacaatctccaagccaaaggcgagccccgagaacca
caggtgtacacctgcccccatcccggtgagctgaccaagaaccaggtcagcctgacctgctgcaaggcttctatcca
gcgacatcgccgtggagtgaggagcaatgggagcgggagagaacaactacaagaccacgcctccctgctggactccgacgg
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ctctgcacaaccactacacgcagaagagcctctcctgtctcgggtaaatgatctaga
20

Amino acid sequence

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
25 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTTVTVSSDQEPKSCDK
THTSPSSAPELGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPASIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
30 NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFSQVMHEALHNHYTQKSLSLS
PGK

29. T256N CH2 region

Nucleotide sequence:

Cctgaactcctggggggaccgtcagttctctctcccccaaaacccaaggacacctcatgatctccggaaacctgaggtca
catgcgtggtggtgacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgcca
agacaaagccgcgggaggagcagtagaacagcagtagcctgtggtcagcgtcctaccgtcctgaccaggactggctgaat
ggcaaggagtacaagtgaaggtctccaacaagccctccagccccatcgagaaaacaatctccaagccaaa
35

Amino acid sequence

PELLGGPSVFLFPPKPKDTLMISRNPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK
40

30. T256N CH2 WCH3

Nucleotide sequence:

cctgaactcctggggggaccgtcagttctctctcccccaaaacccaaggacacctcatgatctccggaaacctgaggtcac
atgcgtggtggtgacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgcca
gacaaagccgcgggaggagcagtagaacagcagtagcctgtggtcagcgtcctaccgtcctgaccaggactggctgaatg
gcaaggagtacaagtgaaggtctccaacaagccctccagccccatcgagaaaacaatctccaagccaaaggcagccc
cgagaaccacaggtgtacacctgcccccatcccggtgatgagtgaccaagaaccaggtcagcctgacctgctgtaagg
50 cttctatccacgcacatcgccgtggagtgaggagcaatggcgagcgggagacaactacaagaccacgcctccctgctggtg

WO 2005/017148

PCT/US2003/041600

actccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtg
atgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

Amino acid sequence

5 PELLGGPSVFLFPPKPKDTLMISRNPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTKISKAKG
QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPV
LDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

10 31. 2H7 scFv VH L11S (SSS-S)H T256N CH2 WCH3

Nucleotide sequence:

aagcttgcggccatgattttcaagtcagattttcagcttctgctaatacagtcgttcagtcataattgccagaggacaaattgttctct
cccagcttcacgaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgttaattacatgcact
15 ggtaccagcagaagccaggtatctccccaaacctggatttatccccatccaaacctggtcttggagtcctgtcgttcagtg
gcagtgggtctgggaccttactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgagggtt
taaccacccacgttcggtgctgggaccaagctggagctgaagatggcgggtggctcggcggtggtggtatctggaggaggtg
ggagctctcaggttatctacagcagctctgggctgagtcggtgagggcctgggctcagtgaaatgctcgaaggtctctggc
tacacattaccagttacaatatgcactgggtaaacgagacacctagacagggcctggaatggattggagctatttatccaggaat
20 ggtgatacttctacaatcagaagtcaagggaaggccacactgactgtagacaaatctccagcacagcctacatgcagtcag
cagcctgacatctgaagactctgcggtctattctgtgcaagagtggtgactatagtaacttactggtacttcgatgctggggcac
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cctggggggaccgtcagttctctctcccccaaaacccaaggacacctcatgactcctccgaaccctgaggtcacatgcgtgg
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25 cgggggaggagcagtcacaacagcacgtaccgtgtggtcagcgtcctaccgtcctgcaccaggactggctgaatggcaaggag
tacaagtcaaggtctccaacaagccctccagcccccagcagaacaaatctccaaagccaaaggcagccccgagaacc
acaggtgtacacctgccccatccgggatgactgaccaagaaccaggtcagcctgacctgcctgggtcaaggcttctatccc
agcgacatcgccgtggagtgaggagcgaatgggcagccggagaacaactacaagaccacgctcccgctgctggactccgacg
gctcctctctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctccgtgatgatgag
30 gctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

Amino acid sequence

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
35 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRNPEVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
40 EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
NNYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSL
SPGK

45 32. 2H7 scFv VH L11S (CSS-S)H T256N CH2 WCH3

Nucleotide sequence:

aagcttgcggccatgattttcaagtcagattttcagcttctgctaatacagtcgttcagtcataattgccagaggacaaattgttctct
cccagcttcacgaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgttaattacatgcact
50 ggtaccagcagaagccaggtatctccccaaacctggatttatccccatccaaacctggtcttggagtcctgtcgttcagtg
gcagtgggtctgggaccttactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgagggtt
taaccacccacgttcggtgctgggaccaagctggagctgaagatggcgggtggctcggcggtggtggtatctggaggaggtg

WO 2005/017148

PCT/US2003/041600

ggagctctcaggcttatctacagcagctctggggctgagtcggtgaggcctggggcctcagtgagatgtcctgcaaggcttctggc
tacacatttaccaggtacaatatgcactgggtaaagcagacacctagacaggcctggaatggattggagctatttatccaggaaaf
ggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctcggtctatttctgtgcaagagtgggtgactatagtaactcttactggctacttcgatgtctggggcac
5 agggaccacgggtcaccgtctctctgatcaggagcccaaatctgtgacaaaactcacacatccccaccgtcctcagcacctgaact
cctgggggggaccgtcagctctctctcccccaaaaacccaaggacaccctcatgatctccggaaacctgaggtcacatgcgtgg
tggtggacgtgagccacgaagaccctgaggtcaagttcaactgggtacgtggacggcgtggaggtgcataatgccaaagacaagc
cgcgaggagagcagtagacaacagcacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
tacaagtgcagggtctccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaaggcgagccccgagaacc
10 acaggtgtacaccctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgcctgggtcaaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgacg
gtcctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcagtag
gtctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

15 Amino acid sequence
MDFQVQIFSFLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
20 TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDQEPKSCDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRNPVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
NNYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFSFSVMHEALHNHYTQKSLSL
25 SPGK

33. RTPE/QNAK (255-258) CH2

Nucleotide sequence:

cctgaactcctggggggaccgtcagctcttctcttcccccaaaaacccaaggacaccctcatgatctcccagaacgtaaggtcac
30 atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttcaactgggtacgtggacggcgtggaggtgcataatgcaa
gacaaagccgaggagagcagtagacaacagcacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctgaatg
gcaaggagtacaagtcaaggtctccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaa

Amino acid sequence

35 PELLGGPSVFLFPPKPKDTLMISQNAKVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK

34. RTPE/QNAK (255-258)CH2 WCH3

Nucleotide sequence:

cctgaactcctggggggaccgtcagctcttctcttcccccaaaaacccaaggacaccctcatgatctcccagaacgtaaggtcac
40 atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttcaactgggtacgtggacggcgtggaggtgcataatgcaa
gacaaagccgaggagagcagtagacaacagcacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctgaatg
gcaaggagtacaagtcaaggtctccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaaggcgagccc
cgagaaccacaggtgtacaccctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgcctgtaaaagg
45 ctctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctgg
actccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtg
atgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

Amino acid sequence

50 PELLGGPSVFLFPPKPKDTLMISQNAKVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKG

WO 2005/017148

PCT/US2003/041600

QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPPV
LDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

35. 2H7 scFv VH L11S (SSS-S)H RTPE/QNAK (255-258)CH2 WCH3

5

Nucleotide sequence:

aagcttccgccatggatttcaagtcagatttccagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgttaattacatgcact
ggtagcagcagaagccagatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgttcagtg
10 gcagtggtctgggacctcttactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgagattt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcgggcgggtggatctggaggagtg
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15 cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtactatagtaactcttactggtagctctgctggggcac
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20 tacaagtgaaggtctccaacaaagccctccagccccatcgagaaacaatctccaaagccaaaggcagccccgagaacc
acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgctcaaggtcttatccc
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gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctccgtgatgatgag
gctctgcacaaccactacacgcagaagagcctctccctgtcicgggtaaatgatctaga

25

Amino acid sequence

MDFQVQIFSLLISASVIIARGQIVLSQSPAILASAPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
30 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISQNAKVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
35 NNYKTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSL
SPGK

36. 2H7 scFv VH L11S (CSS-S)H RTPE/QNAK (255-258)CH2 WCH3

Nucleotide sequence:

aagcttccgccatggatttcaagtcagatttccagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgttaattacatgcact
ggtagcagcagaagccagatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgttcagtg
40 gcagtggtctgggacctcttactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgagattt
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ggagctctcaggcttatctacagcagctggggctgagtcggtgagggcctggggcctcagtgaaagatgctcgaaggcttctggc
45 tacacattaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
ggtagacttcttacaatcagaagttcaagggaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
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50 cctggggggaccgtcagcttctcttcccccaaaacccaaggacacctcatgatctccagaacgctaaggtcacatgcgtgg
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WO 2005/017148

PCT/US2003/041600

cgcgggaggagcagtacaacagcacgtaccgtgtggtcagcgtctcaccgtcctgcaccaggactggctgaatggcaaggag
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5 gctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
10 QQKPGSSPKPWYIAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYNSYWFYFDVWGTGTTVTVSSDQEPKSCDK
15 THTSPSSAPELLGGPSVFLFPPKPKDTLMISQNAKVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
NNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSL
SPGK

20 36. K290Q CH2 region

Nucleotide sequence:

cctgaactcctgggggaccgtcagtccttcttcccccaaaacccaaggacaccctcatgatctcccgaccctgaggtcac
atgctgtgtgtggacgtgagccacgaagaccctgaggtcaagtcaactgtacgtggacggcgtggaggtgcataatgcaa
25 gacacagccgaggaggagcagtacaacagcacgtaccgtgtgtcagcgtctcaccgtcctgcaccaggactggctgaatg
gcaaggagtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaacaatctccaaagccaaa

Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTQPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK

30

37. K290Q CH2 WCH3

Nucleotide sequence:

Cctgaactcctgggggaccgtcagtccttcttcccccaaaacccaaggacaccctcatgatctcccgaccctgaggtca
catgctgtgtgtggacgtgagccacgaagaccctgaggtcaagtcaactgtacgtggacggcgtggaggtgcataatgcca
35 agacacagccgaggaggagcagtacaacagcacgtaccgtgtgtcagcgtctcaccgtcctgcaccaggactggctgaat
ggcaaggagtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaacaatctccaaagccaaaggcagcc
ccgagaaccacaggtgtacacctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgcctggtcaaaag
gcttctatcccgacatcgccgtggagtgggagagcaatgggcagccgggagaacaactacaagaccacgcctcccgtgctg
gactccgacggctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgt
40 gatgcatgaggctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTQPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKG
45 QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPV
LDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

38. 2H7 scFv VH L11S (SSS-S)H K290Q CH2 WCH3

Nucleotide sequence:

aagcttgcggccatggatttcaagtgcagatttcagcttctgctaatcagtgcttcagtcataattgccagaggacaaattgttctt
50 cccagctctccagcaatcctgtctgcattctccaggggagaaggtcacaatgacttcagggccagctcaagtgtaagttacatgcact

WO 2005/017148

PCT/US2003/041600

ggtaccagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgcttcagt
gcagtgggtctgggaccttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtggagttt
taaccacccacgttcgggtctgggaccaagctggagctgaaagatggcggaggctcggcggtggatctggaggaggtg
ggagctctcaggcttatctacagcagcttggggctgagtcggtagggcctggggcctcagtgaagatgctcctgaaggcttctggc
5 tacacatttaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctatttatccaggaaat
ggtgatacttctacaatcagaagttcaagggaagggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggcttattctgtgcaagagtgggtgactatagtaactcttactggacttctgatctggggcac
agggaccacggtcaccgtcttctgacagggagcccaaatcttctgacaaaactcacacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttcttcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtgg
10 tggtagacgtgagccacgaagacctgaggtcaagttcaactggtagcggacggcgtggaggtgcataatgcaagacacagc
cgcgggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtctgcaccaggactggctgaatggcaaggag
tacaagtgaaggtccaacaagccctccagccccatcgagaaaacaatctccaaagccaaaggcagccccgagaacc
acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgcctggtaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccagcctcccgctggtgactccgacg
15 gctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctcgggtaaatgatctaga

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
20 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFVDVWGTGTTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
25 DGVEVHNAKTQPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
PGK

30 39. 2H7 scfv VH L11S (CSS-S)H K290Q CH2 WCH3

Nucleotide sequence:

aagcttgcgccatggatttcaagtcagatttcaagcttctgtaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagctccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgtaattacatgcact
ggtagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgcttcagt
35 gcagtgggtctgggaccttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtggagttt
taaccacccacgttcgggtctgggaccaagctggagctgaaagatggcggaggctcggcggtggatctggaggaggtg
ggagctctcaggcttatctacagcagcttggggctgagtcggtagggcctggggcctcagtgaagatgctcctgaaggcttctggc
tacacatttaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctatttatccaggaaat
ggtgatacttctacaatcagaagttcaagggaagggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
40 cagcctgacatctgaagactctgcggcttattctgtgcaagagtgggtgactatagtaactcttactggacttctgatctggggcac
agggaccacggtcaccgtcttctgacagggagcccaaatcttctgacaaaactcacacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttcttcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtgg
tggtagacgtgagccacgaagacctgaggtcaagttcaactggtagcggacggcgtggaggtgcataatgcaagacacagc
cgcgggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtctgcaccaggactggctgaatggcaaggag
45 tacaagtgaaggtccaacaagccctccagccccatcgagaaaacaatctccaaagccaaaggcagccccgagaacc
acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgcctggtaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccagcctcccgctggtgactccgacg
gctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctcgggtaaatgatctaga

Amino acid sequence:

WO 2005/017148

PCT/US2003/041600

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 FNPPTFGAGTKLELKDGGGSGGGGSGGGSSQAYLQQSGAESVRPGASVKMSCK
 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
 5 TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYDVGWGTGTTVTVSSDQEPKSCDK
 THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
 DGVEVHNAKTQPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
 KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
 NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFCSSVMHEALHNHYTQKSLSLS
 10 PGK

40. A339PCH2

Nucleotide sequence:

cctgaactcctgggggaccgtcagttctctctccccccaaaacccaaggacaccctcatgatctcccgaccctgaggtcac
 15 atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagtcaactggtacgtggacggcgtggaggtgcataatgccaa
 gacaaagccgcgggaggagcagtagacaacagcacgtaccgtgtggtcagcgtcctcaccgtcgtcaccaggactggctgaatg
 gcaaggagtacaagtgcagggtctccaacaaagccctcccagccccatcgagaaaacaatctcaaacccaaa

Amino acid sequence:

20 PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
 AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKPK

41. A339P-CH2 WCH3

25 Nucleotide sequence:

cctgaactcctgggggaccgtcagttctctctccccccaaaacccaaggacaccctcatgatctcccgaccctgaggtcac
 atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagtcaactggtacgtggacggcgtggaggtgcataatgccaa
 gacaaagccgcgggaggagcagtagacaacagcacgtaccgtgtggtcagcgtcctcaccgtcgtcaccaggactggctgaatg
 gcaaggagtacaagtgcagggtctccaacaaagccctcccagccccatcgagaaaacaatctcaaacccaaaagggcagccc
 30 cgagaaccacaggtgtacaccctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcgaagg
 ctctatcccagcgacatcgccgtggagtgaggagagcaatgggcagccggagaaactacaagaccacgcctcccgtgctgg
 actccgacggctctctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctccgtg
 atgcatgaggtctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

35 Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
 AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKPKG
 QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPV
 40 LDSGDSFFLYSKLTVDKSRWQQGNVFCSSVMHEALHNHYTQKSLSLSPGK

42. 2H7 scFv VHL11S (SSS-S)H A339P CH2 WCH3

Nucleotide sequence:

aagcttgccgccatggatttcaagtgcagatttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
 cccagctctccagcaatctgtctgcatctccaggggagaaggtcaccaatgacttgaggccagctcaagtgttaagtacatgcact
 45 ggtaccagcagaagccaggatctccccaaaacccctggatttatccccatccaacctggctctggagtcctgtcgtctcagtg
 gcagtggtgtctgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgaggtt
 taaccaccccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggtcggcggtgtggtatctggaggaggtg
 ggagctctcagccttatctacagcagctctggggtgagtcggtgaggcctgggacctcagtgagatgctcgtcaaggcttctggc
 tacacattaccagttacaatatgcactgggtaaacgagacacctagacagggcctggaatggattggagctatttatccaggaaat
 50 ggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
 cagcctgacatctgaagactctcggtctatttctgtgcaagagtggtgtactatagtaactcttactggtacttcgatgtctggggcac

WO 2005/017148

PCT/US2003/041600

agggaccacgggtcaccgtctctctgatcaggagcccaaatctcttgacaaaactcacacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttctctctctcccccaaaacccaaggacaccctcatgatctccggaccctgagggtcacatgcgtgg
tggtggacgtgagccacgaagaccctgaggtcaagtcaactggtagtggtggcgtggaggtgcataatgccaagacaaagc
cgcgaggagcagtagacaacagcacgtaccgtgtggtcagcgtcctcaccgtctgcaccaggactgggtgaatggcaaggag
5 tacaagtgcagggtctcaacaaagccctcccagccccatcgagaaaacaatctccaaacccaagggcagccccgagaacc
acaggtgtacaccctgccccatcccgggatgagctgaccaagaaccagggtcagcctgacctgcctgggtcaaaggcttctatccc
agcgacatcgccgtggagtgaggagagcaatgggcagccggagaaactacaagaccacgcctcccgtgctggactccgacg
gtctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcagtag
gctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

10

Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
15 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKPKGQPPEPVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
20 NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
PGK

43. 2H7 scFv VHL11S (CSS-S)H A339P CH2 WCH3

25 Nucleotide sequence:

aagcttgccgccattgatttcaagtcagatttccagcttctgctaatcagtgcttcagtcataattgccagaggacaaattgtctct
cccagctctccagcaatcctgtctgcacatccaggaggagaaggtcacatgacttcagggccagctcaagtgttaattacatgcact
ggtagcagcagaagccaggatcctccccaaacctggatttatccccatccaacctggcttctggagtcctgtcgtctcagtg
gcagtgggtctgggacctcttactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggatt
30 taaccacccacgttcgggtgctgggaccaagctggagctgaaagatggcgggtgctcggcggtgggtgagctggaggaggtg
ggagctctcaggcttatctacagcagctggggctgagtcggtaggcctggggcctcagtgaaatgctcctgcaaggctctggc
tacacattaccagttacaatatgcactgggtaaagcagacacctagacagggcctggaatggattggagctattatccagggaat
ggtagacttctcacaatcagaagtcaagggcaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtactatagtaactcttactggtacttcgatgtctggggcac
35 agggaccacgggtcaccgtctctctgatcaggagcccaaatctgtgacaaaactcacacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttctctctctcccccaaaacccaaggacaccctcatgatctccggaccctgagggtcacatgcgtgg
tggtggacgtgagccacgaagaccctgaggtcaagtcaactggtagtggtggcgtggaggtgcataatgccaagacaaagc
cgcgaggagcagtagacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactgggtgaatggcaaggag
tacaagtgcagggtctcaacaaagccctcccagccccatcgagaaaacaatctccaaacccaagggcagccccgagaacc
40 acaggtgtacaccctgccccatcccgggatgagctgaccaagaaccagggtcagcctgacctgcctgggtcaaaggcttctatccc
agcgacatcgccgtggagtgaggagagcaatgggcagccggagaaactacaagaccacgcctcccgtgctggactccgacg
gtctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcagtag
gctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

45 Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
50 TAYMQLSSLTSEDSAVYFCARVVYYNSNSYWFYFDVWGTGTTVTVSSDQEPKSCDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV

WO 2005/017148

PCT/US2003/041600

DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKPKGQPREEPVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVSCSVMHEALHNHYTQKSLSLS
PGK

5

44. G28-1VH

Nucleotide sequence:

gcgggtccagctgcagcagctggacctgagctgaaaagcctggcgcttcagtgaaatttctgcaaggcttctggttactcattc
10 actggctacaatatgaactgggtgaagcagaataatgaaagagccttgagtgattggaaatattgatccttattatggtggtacta
cctacaaccgggaagtcaagggcaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctctgac
atctgaggactctgcagctctattactgtgcaagatcggtcgccctatggactactgggggtcaaggaacctcagtcaccgtctcttc
gatcag

15 Amino acid sequence:

AVQLQQSGPELEKPGASVKISCKASGYSFTGYNMNWVKQNNGKSLEWIGNIDPY
YGGTTYNRKFKGKATLTVDKSSSTAYMQLKSLTSEDSAVYYCARSVGPMDYWG
QGTSVTVSSDQ

45. G28-1VL

Nucleotide sequence:

aagcttgcggccatggtatccacagctcagttccttgggttgctgctgctgtggcttacaggtggcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatatgttacagttatttggcttggt
atcagcagaaacagggaatatctcctcagctcctgggtctcttttgcacaaaccttagcagaaggtgtgccatcaagggtcagtgga
25 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
ccgtggacgttcggtggaggcaccgaactggagatcaaaaggtggcgggtggctcgggcgggtgggtgggtcgggtggcgccggat
cgta

Amino acid sequence:

30 MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLA
YQQKQKGKSPQLLVSFATLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHHS
DNPWTFGGGTELEIKGGGSGGGGSGGGGSS

46. G28-1 scFv

Nucleotide sequence:

aagcttgcggccatggtatccacagctcagttccttgggttgctgctgctgtggcttacaggtggcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatatgttacagttatttggcttggt
atcagcagaaacagggaatatctcctcagctcctgggtctcttttgcacaaaccttagcagaaggtgtgccatcaagggtcagtgga
40 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
ccgtggacgttcggtggaggcaccgaactggagatcaaaaggtggcgggtggctcgggcgggtgggtgggtcgggtggcgccggat
cgtcagcgggtccagctgcagcagcttgacctgagctgaaaagcctggcgcttcagtgaaatttctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatgaaagagccttgagtgattggaaatattgatccttattatggtggt
actacctacaaccgggaagtcaagggcaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
45 gacatctgaggactctgcagctctattactgtgcaagatcggtcgccctatggactactgggggtcaaggaacctcagtcaccgtctc
ttctgatcag

Amino acid sequence:

50 MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLA
YQQKQKGKSPQLLVSFATLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHHS
DNPWTFGGGTELEIKGGGSGGGGSGGGGSSAVQLQQSGPELEKPGASVKISCKA

WO 2005/017148

PCT/US2003/041600

SGYSFTGYNMNWWVKQNNNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
AYMQLKSLTSEDSAVYYCARSVGPMDYWGQTSVTVSSDQ

5 **47. G28-1 VHL11S**

Nucleotide sequence:

gcgggtccagctgcagcagctcggacctgagtcggaaaagcctggcgcttcagtgaaagattcctgcaaggcttctggttactcattc
actggtcacaatatgaactgggtgaagcagaataatggaaagagccttgagtgattggaaatattgatccttattatggtggtacta
cctacaaccggaagttcaaggggcaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctgac
10 atctgaggactctgcagctctattactgtgcaagatcggtcggccctatggactactggggtaaggaacctcagtcaccgtctctct
gatcag

Amino acid sequence:

15 AVQLQQSGPESEKPGASVKISCKASGYSFTGYNMNWWVKQNNNGKSLEWIGNIDPYY
GGTTYNRKFKGKATLTVDKSSSTAYMQLKSLTSEDSAVYYCARSVGPMDYWGQ
GTSVTVSSDQ

20 **48. G28-1 VHL11S scFv**

Nucleotide sequence:

aagcttgcgcctatggtatccacagctcagttccttgggttgctgctgctgtggcttacagtggtgcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatatgtttacagttatttggcttgg
atcagcagaacagggaaaatctctcagctcctggtctcttttgcacaaaccttagcagaaggtgtccatcaagggtcagtgga
25 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagttatttctgcaacatcattccgataat
ccgtggacgttcgggtggagccaccgaactggagatcaaaaggtggcgggtgctcggcggttgggtgggtcgggtggcggcggt
cgtcagcgggtccagctgcagcagcttgacctgagtcgaaaagcctggcgcttcagtgaaagattcctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatggaaagagccttgagtgattggaaatattgatccttattatggtggt
actacctacaaccggaagttcaagggcaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
30 gacatctgaggactctgcagctctattactgtgcaagatcggtcggccctatggactactggggtaaggaacctcagtcaccgtctc
ttctgatcag

Amino acid sequence:

35 MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLA
YQKQKQKSPQLLVSFATLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHH
DNPWTFGGGTELEIKGGGGSGGGSGGGSSAVQLQQSGPESEKPGASVKISCKA
SGYSFTGYNMNWWVKQNNNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
AYMQLKSLTSEDSAVYYCARSVGPMDYWGQTSVTVSSDQ

40 **49. G28-1 scFv (SSS-S)H WCH2 WCH3**

Nucleotide sequence:

aagcttgcgcctatggtatccacagctcagttccttgggttgctgctgctgtggcttacagtggtgcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatatgtttacagttatttggcttgg
atcagcagaacagggaaaatctctcagctcctggtctcttttgcacaaaccttagcagaaggtgtccatcaagggtcagtgga
45 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagttatttctgcaacatcattccgataat
ccgtggacgttcgggtggagccaccgaactggagatcaaaaggtggcgggtgctcggcggttgggtgggtcgggtggcggcggt
cgtcagcgggtccagctgcagcagcttgacctgagtcgaaaagcctggcgcttcagtgaaagattcctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatggaaagagccttgagtgattggaaatattgatccttattatggtggt
actacctacaaccggaagttcaagggcaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
50 gacatctgaggactctgcagctctattactgtgcaagatcggtcggccctatggactactggggtaaggaacctcagtcaccgtctc
ttctgatcatgatcaggagcccaaatcttctgacaaaactcacacatcccaccgtcctcagcacctgaactcctgggggggaccgtc

WO 2005/017148

PCT/US2003/041600

agtcttctcttcccccaaaacccaaggacacctcatgatctcccgaccctgaggtcacatgcgtggtggtggacgtgagcc
 acgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatccaagacaaagccgaggaggagca
 gtacaacagcacgtaccgtgtggtcagcgtctcaccgtctgcaccaggactggctgaatggcaaggagtacaagtgcaaggct
 tccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaaccacaggtgtacacct
 5 gccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaggcttctatcccagcgacatcgccgtg
 gagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgacggctccttctctctac
 agcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgaggtctgcacaaccact
 acacgcagaagagcctctcctgtctccgggtaaatgatctaga

10 Amino acid sequence:

MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLAW
 YQQKQGKSPQLLVSF AKTLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHHS
 DNPWTFGGGTELEIKGGGGSGGGSGGGSSAVQLQQSGPELEKPGASVKISCKA
 SGYSFTGYNMNWKQNNKGSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
 15 AYMQLKSLTSEDSAVYYCARSVGPMDYWGQTSVTVSSDHDQEPKSSDKTHTSP
 PSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVE
 VHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISK
 AKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKT
 TPPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

20

50. G28-1 scFv IgAW H IgG1WCH2 WCH3

Nucleotide sequence:

aagettccgccatglatccacagctcagttccttgggtgctgctgctggtgcttacaggtggcagatgtgacatccagatgactc
 agtctccagctccctatctgcatctgtggagagactgtcaccatcacatgtcgaacaagtgaatatgtttagatttggcttggt
 25 atcagcagaacagggaaaatctcctcagctcctggtctcttttgcacaaacctagcagaaggtgtccatcaagggtcagtgga
 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgcaacatcattccgataat
 ccgtggacgttcggtggagccaccgaactggagatcaaaagtgccgggtgctcggcggtggtgggtcgggtggcgccggat
 cgtcagcggtccagctgcagcagctgtgacctgagctggaaaagcctggcgcttcagtgagatttctgcaaggcttctgttact
 cattcactggctacaatatgaactgggtgaagcagaataatgaaagagccttgagtggaattggaatatgatccttattatggtggt
 30 actacctacaaccggaagtcaagggaaggccacattgactgtagacaaatctccagcacagcctacatgcagctcaagagctt
 gacatctgaggactctgcagcttattactgtgaagatcggtcggccctatggactactggggtcaaggaaacctcagtcaccgtctc
 ttctgatcagccagttccctcaactccacctacccatctccctcaactccacctacccatctccctcatcgccacctgaactcctgg
 gggaccgtcagttctcttcccccaaaacccaaggacacctcatgatctcccgaccctgaggtcacatgcgtggtggtg
 gacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatccaagacaaagccgag
 35 ggaggagcagtcacaacagcacgtaccgtgtggtcagcgtctcaccgtctgcaccaggactggctgaatggcaaggagtacaa
 gtgcaaggtctccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaaccacagg
 tgfacacctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaggcttctatcccagcga
 catcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgacggctcct
 tctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgaggtctg
 40 cacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLAW
 YQQKQGKSPQLLVSF AKTLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHHS
 45 DNPWTFGGGTELEIKGGGGSGGGSGGGSSAVQLQQSGPELEKPGASVKISCKA
 SGYSFTGYNMNWKQNNKGSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
 AYMQLKSLTSEDSAVYYCARSVGPMDYWGQTSVTVSSDQVPSTPPTPSPSTPPT
 PSPSCAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDG
 VEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTI
 50 SKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNY

WO 2005/017148

PCT/US2003/041600

KTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPG
K

51. G28-1 scFv VHL11S (SSS-S)H WCH2 WCH3

5 Nucleotide sequence:

aagcttgccgcatggtatccacagctcagttccttgggtgctgctgctggttacaggtggcagatgtgacatccagatgactc
agtcaccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaataatgttacagtatttgcttgg
atcagcagaaacagggaaaatctctcagctcctggtctctttgcaaaaaccttagcagaaggtgtccatcaaggttcagtgga
gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
10 ccgtggacgttcggtggagggcaccgaactggagatcaaaaggtggcgggtggctcggcggtggtgggtggcggcggtg
cgtcagcgggtccagctgcagcagctgtgacctgagtcggaaaagcctggcgcttcagtggaatttctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatgaaagagccttgagtgattggaatatgacatttattatggtggt
actacctacaaccggaagtcaagggaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
gacatctgaggactctgcagctctattactgtgaagatcggtcggccctatggactactgggtgcaaggaaacctcagtcaccgtctc
15 ttctgatcaggagcccaaatcttctgacaaaactcacatccccaccgtcctcagcacctgaactcctggggggaccgtcagctct
cctcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtggtggtggacgtgagccacgaa
gacctgaggtcaagttcaactggtacgtggacggcggtggaggtgcataatgccaagacaaagccggggaggagcagtagaa
cagcacgtaccgtgtggtcagcgtcctaccgtctgcaccaggactggctgaatggcaaggagtacaagtgcagggtctccaac
aaagccctcccagccccatcgagaaaacaatctccaagccaaagggcagccccgagaaccacaggtgtacacctgcccc
20 atccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcgaaggcttctatcccagcgacatcgccgtggagtg
gagagcaatgggcagccggagaaacaactacaagaccacgctcctcgtggtgactccgacggctccttctctctacagcaag
ctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgaggctctgcacaaccactacagc
agaagagcctctcctgtctccggtaaatgatctaga

25 Amino acid sequence:

MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTTTCRTSENVYSYLA
YQQKQKGKSPQLLVSFATLAEGVPSRFSGSGSGTQFSLKISSLQPEDSGSYFCQHH
DNPWTFGGGTELEIKGGGSGGGGSGGGGSSAVQLQSGPSEKPGASVKISCKA
SGYSFTGYNMNWKQNNNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
30 AYMQLKSLTSEDSAVYYCARSVGPMDYWGQGTSTVTVSSDHDQEPKSSDKTHTSP
PSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFNWYVDGVE
VHNAKTKPREEQYNSTYRVVSVLTVHLQDNLNGKEYKCKVSNKALPAPIEKTISK
AKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKT
TPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK
35

52. G28-1 scFv VHL11S (CSS-S)H WCH2 WCH3

Nucleotide sequence:

aagcttgccgcatggtatccacagctcagttccttgggtgctgctgctggttacaggtggcagatgtgacatccagatgactc
agtcaccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaataatgttacagtatttgcttgg
40 atcagcagaaacagggaaaatctctcagctcctggtctctttgcaaaaaccttagcagaaggtgtccatcaaggttcagtgga
gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
ccgtggacgttcggtggagggcaccgaactggagatcaaaaggtggcgggtggctcggcggtggtgggtggcggcggtg
cgtcagcgggtccagctgcagcagctgtgacctgagtcggaaaagcctggcgcttcagtggaatttctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatgaaagagccttgagtgattggaatatgacatttattatggtggt
45 actacctacaaccggaagtcaagggaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
gacatctgaggactctgcagctctattactgtgaagatcggtcggccctatggactactgggtgcaaggaaacctcagtcaccgtctc
ttctgatcaggagcccaaatcttctgacaaaactcacatccccaccgtcctcagcacctgaactcctggggggaccgtcagctct
cctcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtggtggtggacgtgagccacgaa
gacctgaggtcaagttcaactggtacgtggacggcggtggaggtgcataatgccaagacaaagccggggaggagcagtagaa
50 cagcacgtaccgtgtggtcagcgtcctaccgtcctgcaccaggactggctgaatggcaaggagtacaagtgcagggtctccaac
aaagccctcccagccccatcgagaaaacaatctccaagccaaagggcagccccgagaaccacaggtgtacacctgcccc

WO 2005/017148

PCT/US2003/041600

atcccgggatgagctgaccaagaaccaggctcagcctgacctgcctgggtcaaaggcttctatccagcgacatcgccgtggagtgg
gagagcaatgggcagccgggagaacaactacaagaccacgcctcccgctgctggactccgacggctcttcttctctacagcaag
ctcaccgtggacaagagcaggtggcagcaggggaaacgtcttctcatgctccgtgatgcatgaggctctgcacaaccactacacgc
agaagagcctctccctgtctccgggtaaatgatctaga

5

Amino acid sequence:

MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLAW
 YQQKQKGKSPQLLVSF AKTLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHHS
 DNPWTFGGGTELEIKGGGSGGGGSGGGGSSAVQLQQSGPESEKPGASVKISCKA
 10 SGYSFTGYNMNWVKQNGKSLEWIGNIDPYGGTTYNRKFKGKATLTVDKSSST
 AYMQLKSLTSEDSAVYYCARSVGPM DYWGQTSVTVSSDQEPKSCDKTHTSPSS
 APELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVH
 NAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK
 GQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPP
 15 VLDSGSGFFLYSKLTVDKSRWOOGNVFSCSVMHEALHNHYTOKLSLSLSPGK

53. G28-1 scFv VH L11S (CSC-S)H WCH2 WCH3

Nucleotide sequence:

20 aagcttgcgcgatggtatccacagctcagttccttgggttgctgctgctgtggcttacaggtggcagatgtgacatccagatgactc
agctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatatgttacagttatttgcttgggt
atcagcagaaacagggaatatctctcagctcctgggtctctttgcaaaaaccttagcagaaggtgtgccatcaagggttcagttggca
gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcatccgataat
ccgtggacgttcgggtggagggcaccgaactggagatcaaaaggtggcgggtggctcggcggtgggtgggtcgggtggcgccgat
25 cgtcagcgggtccagctgcagcagctctggacctgagtcggaaaagcctggcgcttcagtgaagatttctgcaaggcctcttggttact
cattcacigggctacaatatgaactgggtgaagcagaataatggaagagccttgagtggattggaatatattgaccccttattatggtgggt
actacctacaaccggaagltcaagggcgaaggccacatftgactgtagacaaatcctccagcacagcctacatgcagctcaagaagtct
gacatctgaggactctgcagctcttactgtgcaagatcggtcggccctatggactactgggggtcaaggaaacctcagtcaccgtctc
ttctgatcaggagcccaatcttgtgacaaaactcacacatctccaccgtgctcagcacctgaactcctgggtggaccgtcagctctc
ctcttccccccaaaacccaaggacacctcatgatctccgggaccctgaggtcacatgcgtggtgggtggacgtgagccacgaag
30 acctgaggtcaaggtcaactgtacgtggacggcggtggaggtgcataatgccaagacaaagccgcgggaggagcagtacaac
agcagctaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggagtacaagtgaaggcttccaaca
aagccctcccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaaccacaggtgtacacctgccccca
tccgggatgagctgaccaagaaccagggtcagcctgacctgacctgggtcaaaaggcttctatccaagcgacatcgccgtggagtgg
gagagcaatgggcagccggagaaacaactacaagaccacgctcccgctgctggactccgacggctccttctcctctacagcaag
35 ctccacctggacaagagcaggtggcagcagggggaacgtcttctcatgctccgtgatgcgatgaggtctgcacaaccactacacgc
agaagagcctctccctgtctccgggttaaatgatctaga

Amino acid sequence:

40 MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVVSYLAW
YQQKQKGKSPQLLVSF AKTLAEGVPSRFGSGSGGTQFSLKISSLPEDSGSYFCQHHS
DNPWTFGGGTELEIKGGGGSGGGSGGGGSSAVQLQQSGPESEKPGASVKISCKA
SGYSFTGYNMNWKQNNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
AYMQLKSLTSEDSAVYYCARSVGPM DYWGQGTSVTVSSDQEPKSCDKTHTSPPC
45 SAPELLGGPSVFLFPPKPKDTLMISRTP E VTCVVVDVSHEDPEVKFNWYVDGVEV
HNAKTKPREEQYNSTYRVVSVLTVLHQD WLNGKEYCKCKVSNKALPAPIEKTISKA
KGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYK TTP
PVLDS DGSFFLYSKLTVDKSRWOOGNV FSCSV MHEALHNHYTOKSLSLSLSPGK

50 54. G28-1 scFv VH L11S (SSC-P)H WCH2 WCH3

Nucleotide sequence:

WO 2005/017148

PCT/US2003/041600

aagcttgccgcatggtatccacagctcagttccttgggtgctgctgctgtggcttacaggtggcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatatgtttacagttatttgcttggg
atcagcagaacagggaatatctcctcagctcctggtctcttttgcataaaccttagcagaagggtgcatcaagggtcagtgga
gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
5 ccgtggacgttcggtggagggaccgaactggagatcaaaagggtggcgggtggctcgggcgggtggtgggtcgggtggcggcgat
cgtcagcgggtccagctgcagcagctggtgacgtgagtcgaaaagcctggcgctcagtgaaagtcttgcagggtcttggttact
cattcactggctacaataatgaactgggtgaagcagaataatggaagagccttgagtggaattggaatattgatccttattatggtgt
actacctacaaccggaagtcaagggaaggccacattgactgtgacaaaatcctccagcacagcctcatgcagctcaagagct
gacatctgaggactctgcagctctattactgtcaagatcggtcgccctatggactactgggtcaaggaaacctcagtcaccgtctc
10 tctgatcaggagcccaaatctctgacaaaactcacacatccccaccgtgcccagcacctgaactcctggggggaccgtcagctct
cctctccccccaaaacccaaggacacctcatgatctccggaccttgaggtcacatgcgtggtggtggacgtgagccacgaa
gacctgaggtcaagtcaactggtacgtggacggcgtggaggtgcataatgcaagacaagccggcgggaggagcagtaaa
cagcacgtaccgtgtgtcagcgtcctcaccgtctgcaccaggactggctgaatggcaaggagtacaagtgaagggtctccaac
aaagccctcccagccccatcgagaaaacaatctcaaaagccaaagggcagccccgagaaccacaggtgtacacctgcccc
15 atccgggatgagctgaccaagaaccagggtcagcctgacctggtcgaaggctctatccagcgacatcgccgtggagtgg
gagagcaatgggcagccggagaaacaactacaagaccacgctcctcgctggactccgacggctccttctctctacagcaag
ctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctccgtgatgcatgaggtctctgcacaaccactacacgc
agaagagcctctcctgtctccggtaaatgatctaga

20 Amino acid sequence:

MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLA
YQQKQKSPQLLVSFAKTLAEGVPSRFSGSGSGTQFSLKISSLQPEDSGSYFCQHHS
DNPWTFGGGTELEIKGGGSGGGGSGGGGSSAVQLQQSGPESEKPGASVKISCKA
SGYSFTGYNMNWKQNNKSLWIGNIDPYGGTTYNRKFKGKATLTVDKSSST
25 AYMQLKSLTSEDSAVYYCARSVGPM DYWGQGTSVTVSSDQEPKSSDKTHTSPPCP
APELLGGPSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFNWYVDGVEVH
NAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK
GQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPP
VLDSDGSFFLYSKLTVDKSRWQQGNV FSCSV MHEALHNHYTQKSLSLSPGK
30

II. 54. HCTLA4 HIGG1 (SSS-S)H P238SCH2 WCH3

Nucleotide sequence:

atggctgacctgatttcagcggcacaaggctcagctgaacctggctgccaggacctggcctgcactctcctgtttttctctctc
atcctgtctctgcaaaagcaatgcacgtggccagcctgctgtggtactggccagcagccgaggtcgcacgtttgtgtga
35 gtatgcatctccagcgaaggcactgaggtccgggtgacagtgttcggcaggtgacagccaggtgactgaagtctgtcggc
aacctacatgacgggaatgagtgacctcttagatgattccatctgcacgggcacctccagtgaatacaagtgaacctcactat
ccaaggactgagggccatggacacgggactctacatctgcaagggtggagctcatgtaccaccgccatactacctgggcatagg
caacggaaccagatttatgtaattgatccagaacctgcccagattctgatcaacccaaatctctgacaaaactcacacatcccca
cgtcctcagcactgaactcctggggggatcgtcagttctcttccccccaaaacccaaggacacctcatgatctccggac
40 cctgaggtcacatgcgtggtggtggacgtgagccacgaagacctgaggtcaagtcaactggtacgtggacggcgtggaggt
gcataatgcaagacaagccgcgggaggagcagtaaacagcacgtaccgtgtgtcagcgtcctcaccgtctgcaccagg
actggctgaatggcaaggagtacaagtcaaggtctccaacaagccctcccagccccatcgagaaaacaatctccaaagcca
aagggcagccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgc
ctgtcaaaaggctctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaaacaactacaagaccacgcc
45 tccgtgctgactccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctct
catgctccgtgatgcatgaggtctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatga

Amino acid sequence:

MACLGFRHKAQLNLAARTWPCTLLFFLLFIPVFCKAMHVAQPAVV LASSRGIAS
50 FVCEYASPGKATEVRVTVLRQADSQVTEVCAATYMTGNELTFLDDSICTGTSSGN

WO 2005/017148

PCT/US2003/041600

QVNLTIQGLRAMDTGLYICKVELMYPPPYLIGINGTQIYVIDPEPCPDSDQPKSSD
KTHTSPPSSAPELLGGSSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
5 NNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFSFSVMHEALHNHYTQKSLSL
SPGK

55. FC2-2 VL

Nucleotide sequence:

10 gttgtaagcttgcgccatggattcacaggccaggttctatgttactgctgctatgggtatctggtacctgtggggacattgtgatg
tcacagtctccatcctcctagctgtgtcagttggagagaaggtttctatgagctgcaagtccagtcagagccctttatataatcacaat
caaaagaactacttggcctggtaccagcagataaccaggcagctctcctaaactgctgatttactgggcacccactaggggaatctgg
ggtccctgatcgttcacaggcagtggtatctgggacagatttactctcaccatcagcagagtgaaggctgaagacctggcagttta
15 ttactgtcagcaatattatactatcctccacgttcggaggtggcaccaagctggaaataaaaaggtggcgggtgctcgggcgggtg
gtgggtcgggtggcggcgggagctcg

Amino acid sequence:

MDSQAQVLMMLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
QKNYLAWYQQIPGQSPKLLIYWASTRESGVPDRFTGSGSGTDFTLTISR VKAEDLA
20 VYYCQQYYTYPPTFGGG TKLEIKGGGSGGGGSGGGGSS

56. FC2-2VH

Nucleotide sequence:

Gggagctcgcaggtgcagttgaaggagtcaggacctggcctggcggccctcacagagcctgtccatcacatgcaccgtctca
25 ggggtctcattaacctgtctatgggttaactgggttcgccagcctccaggaaagggtctggactggcgggaatgatatggggat
ggaagcacagactataattcagctctcaatccagactgagcatcagtaaggacaactccaagagccaagtttcttaaaaatggac
agtctacaaactgatgacacagccaggtactactgtgccagagatcactatggtaccactatgctatggactactggggcaagga
acctcagtcaccgtctcctctgatcag

30 Amino acid sequence:

GSSQVQLKESGPGLVAPSQSL SITCTVSGFSLTVYGVNWVRQPPGKGLDWLGMIW
GDGSTDYNSALKSRLSISKDNSKSQVFLKMDSLQTDDTARYYCARDHYGTHYAM
DYWGQGTSTVTVSSDQ

35 57. FC2-2scFv

Nucleotide sequence:

gttgtaagcttgcgccatggattcacaggccaggttctatgttactgctgctatgggtatctggtacctgtggggacattgtgatg
tcacagtctccatcctcctagctgtgtcagttggagagaaggtttctatgagctgcaagtccagtcagagccctttatataatcacaat
caaaagaactacttggcctggtaccagcagataaccaggcagctctcctaaactgctgatttactgggcacccactaggggaatctgg
40 ggtccctgatcgttcacaggcagtggtatctgggacagatttactctcaccatcagcagagtgaaggctgaagacctggcagttta
ttactgtcagcaatattatactatcctccacgttcggagggtggcaccaagctggaaataaaaaggtggcgggtggtcgggcgggtg
gtgggtcgggtggcggcgggagctctcaggtgcagttgaaggagtcaggacctggcctggtggcggccctcacagagcctgtcc
atcacatgcaccgtctcagggttctcattaacctgtatggtgtaactgggttcgccagcctccaggaaagggtctggactggctgg
gaatgatatggggtgatggaagcacagactataattcagctctcaatccagactgagcatcagtaaggacaactccaagaccaa
45 gttttcttaaaaatggacagctctacaaactgatgacacagccaggtactactgtgccagagatcactatggtaccactatgctatgg
actactggggtaaggaacctcagtcaccgtctcctctgatcag

Amino acid sequence:

MDSQAQVLMMLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
50 QKNYLAWYQQIPGQSPKLLIYWASTRESGVPDRFTGSGSGTDFTLTISR VKAEDLA
VYYCQQYYTYPPTFGGG TKLEIKGGGSGGGGSGGGGSSQVQLKESGPGLVAPSQ

WO 2005/017148

PCT/US2003/041600

SLSITCTVSGFSLTVYGVNWVRQPPGKGLDWLGMWGDGSTDYNSALKSRLSISK
DNSKSQVFLKMDSLQTTDDTARYYCARDHYGTHYAMDYWGQGTSVTVSSDQ

58. FC2-2 VHL11S

5 Nucleotide sequence:
gggagctctcaggtgcagttgaaggagtcaggacctggctcggcggccctcacagagcctgtccatcacatgcaccgtctcag
gggtctcattaaccgtctatgggttaactgggtcggcagcctccaggaaagggtctggactggcgaatgatatggggtgatg
gaagcacagactataaattcagctctcaaatccagactgagcatcagtaaggacaactccaagagccaagtttctaaaaatggaca
gtctacaaactgatgacacagccaggtactactgtgccagagatcactatgggtaccactatgctatggactactggggtcaaggaa
10 cctcagtcaccgtctcctctgatcag

Amino acid sequence:
(GSS)QVQLKESGPGSVAPSQSLSITCTVSGFSLTVYGVNWVRQPPGKGLDWLGM
WGDGSTDYNSALKSRLSISKDNSKSQVFLKMDSLQTTDDTARYYCARDHYGTHYA
15 MDYWGQGTSVTVSSDQ

59. FC2-2 VH L11S scFv

Nucleotide sequence:
gttgtaagcttgcggccatggattcacaggcccaggttctatgttactgctgctatgggtatctgtgtacctgtggggacattgtgatg
20 tcacagctctccatcctcctagctgtgtcagttggagagaagggttctatgagctgcaagtcagtcagagcctttatataatcacaat
caaaagaactacttggcctgtgaccagcagataccaggcagctctcctaaactgctgatttactgggcatccactagggaatctgg
ggtcctgatcgttcacaggcagtgatctgggacagatttactctcaccatcagcagagtgaaggctgaagacctggcagttta
ttactgtcagcaatattatacctatcctcccagctcggaggtggcaccagctggaaataaaagggtggcgggtggtcggcggtg
25 gtgggtcgggtggcggcgggagctctcaggtgcagttgaaggagtcaggacctggctcgggtggcggcctcacagagcctgtcc
atcacatgcaccgtctcagggttctcattaaccgtctatgggttaactgggtcggcagcctccaggaaagggtctggactggctgg
gaatgatatggggtgatggaagcacagactataaattcagctctcaaatccagactgagcatcagtaaggacaactccaagagccaa
gttttctaaaaatggacagctctacaaactgatgacacagccaggtactactgtgccagagatcactatgggtaccactatgctatgg
actactgggggtcaaggaaacctcagtcaccgtctcctctgatcag

30 Amino acid sequence:
MDSQAQVLMMLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
QKNYLAWYQQIPGQSPKLLIYWASTRESGVPDRFTGSGSGTDFTLTISR VKAEDLA
VYYCQQYYTYPPTFGGGTKLEIKGGGGSGGGGSGGGGSSQVQLKESGPGSVAPSQ
SLSITCTVSGFSLTVYGVNWVRQPPGKGLDWLGMWGDGSTDYNSALKSRLSISK
35 DNSKSQVFLKMDSLQTTDDTARYYCARDHYGTHYAMDYWGQGTSVTVSSDQ

60. FC2-2 (SSS-S)H WCH2 WCH3

Nucleotide sequence:
gttgtaagcttgcggccatggattcacaggcccaggttctatgttactgctgctatgggtatctgtgtacctgtggggacattgtgatg
40 tcacagctctccatcctcctagctgtgtcagttggagagaagggttctatgagctgcaagtcagtcagagcctttatataatcacaat
caaaagaactacttggcctgtgaccagcagataccaggcagctctcctaaactgctgatttactgggcatccactagggaatctgg
ggtcctgatcgttcacaggcagtgatctgggacagatttactctcaccatcagcagagtgaaggctgaagacctggcagttta
ttactgtcagcaatattatacctatcctcccagctcggaggtggcaccagctggaaataaaagggtggcgggtggtcggcggtg
45 gtgggtcgggtggcggcgggagctctcaggtgcagttgaaggagtcaggacctggcctgggtggcggcctcacagagcctgtcc
atcacatgcaccgtctcagggttctcattaaccgtctatgggttaactgggtcggcagcctccaggaaagggtctggactggctgg
gaatgatatggggtgatggaagcacagactataaattcagctctcaaatccagactgagcatcagtaaggacaactccaagagccaa
gttttctaaaaatggacagctctacaaactgatgacacagccaggtactactgtgccagagatcactatgggtaccactatgctatgg
actactgggggtcaaggaaacctcagtcaccgtctcctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtcct
cagcacctgaactcctgggtggaccgtcagcttctcttccccccaaaacccaaggacacctcatgatctccggacctctgag
50 gtcacatgcgtgggtgggacgtgagccacgaagacctgaggtcaagtcaactgttacgtggacggcgtggaggtgcataat
gccaaagacaagccgcgggaggagcagtaacacagcagtcaccgtgtgtgtcagcgtcctcaccgtctgcaccaggactggct

WO 2005/017148

PCT/US2003/041600

gaatggcaaggagtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaaccatctccaagccaaagggc
agccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgtgca
aaggcttctatccaagcgacatcgccgtggagtgaggagcaatggcgagccggagaacaactacaagaccacgctcccggtg
ctggactccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctc
5 cgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

Amino acid sequence:

MDSQAQVLMLLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
QKNYLA WYQQIPGQSPKLLIYWASTRESGVPDRFTGSGSGTDFLTISR VKAEDLA
10 VYYCQQYYTYPPTFGGGTKLEIKGGGSGGGGSGGGGSSQVQLKESGPGLVAPSQ
SLSITCTVSGFSLTVYGVNWVRQPPGKGLDWLGMIWGDGSTDYNSALKSRLSISK
DNSKSQVFLKMDSLQTD D TARYYCARDHYGTHYAMDYWGQGTSVTVSSDQEPK
SSDKTHTSPSSAPELLGGPSVFLFPPKPKDTLMISRTP EVTCVVVDVSHEDPEVKF
NWYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKA
15 LPAPIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESN
GQPENNYKTTTPVLDS DGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQ
KSLSLSPGK

61. FC2-2 VHL11S (SSS-S)H WCH2 WCH3

20 Nucleotide sequence:

gttgtaagcttgcgccatggaatcacaggccaggttctatgttactgctgctatgggtatctggtacctgtggggacattgtgatg
tcacagtctccatcctcctagctgtgtcagttggagagaaggtttctatgagctgcaagtcagtcagagcctttatataatcacat
caaaagaactacttggcctggtaccagcagataccagggcagctctctaaactgctgatttactgggcatccactagggaatctgg
ggtccctgatcgcttcacaggcagtgatctgggacagattcactctcaccatcagcagagtgaaggctgaagacctggcagttta
25 ttactgtcagcaatattatctatcctccacgttcggaggtggcaccagctgaaataaaagggtggcgggtggctcggcggtg
gtgggtcgggtggcggggagctctcaggtgcagtggaaggagtcaggacctggctcgggtggcgccctcagagacctgtcc
atcacatgcaccgtctcagggttctcattaaccgtctatggtgtaactgggttcgccagcctccaggaaagggtctggactggctgg
gaatgatattgggtgatggaagcacagactataaactcagctctcaaatccagactgagcatcagtaaggacaactccaagagccaa
gtttcttaaaatggacagctacaaactgatgacacagccaggtactactgtgccagagatcactatggtaccactatgctatgg
30 actactggggtaaggaacctcagtcaccgtctcctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtcct
cagcacctgaactcctgggtggaccgtcagctctcctctcccccaaaacccaaggacacctcatgatctcccgaccctgag
gtcatatcggtggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataat
gccaaagacaaagccgcgggagagcagtaacagacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactgggt
gaatggcaaggagtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaaccatctccaagccaaagggc
35 agccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgacctgctgca
aaggcttctatccaagcgacatcgccgtggagtgaggagcaatgggcagccggagaacaactacaagaccacgctcccggtg
ctggactccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctc
cgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

40 Amino acid sequence:

MDSQAQVLMLLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
QKNYLA WYQQIPGQSPKLLIYWASTRESGVPDRFTGSGSGTDFLTISR VKAEDLA
45 VYYCQQYYTYPPTFGGGTKLEIKGGGSGGGGSGGGGSSQVQLKESGPGSVAPSQ
SLSITCTVSGFSLTVYGVNWVRQPPGKGLDWLGMIWGDGSTDYNSALKSRLSISK
DNSKSQVFLKMDSLQTD D TARYYCARDHYGTHYAMDYWGQGTSVTVSSDQEPK
SSDKTHTSPSSAPELLGGPSVFLFPPKPKDTLMISRTP EVTCVVVDVSHEDPEVKF
NWYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKA
LPAPIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESN
GQPENNYKTTTPVLDS DGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQ
50 KSLSLSPGK

WO 2005/017148

PCT/US2003/041600

62. UCHL-1 VH

Nucleotide sequence:

atgggcaggcttacttctcattctgctactgattgttctgcataatgtcctctcccagattactctgaaagagcttgccctgggactct
gcagccctcccagaccctcagctgactgttcttctctgggttttactgaccattatggtataggagtaggttgattcgtcagcct
5 ccagggaagggtctggagtggtgacacacatttggtggaatgataataagtactataacacagccctgaggagccggctcaca
tctccaaggattcctccaacaaccaagtactcctcaagatgccaatgtggacactgcagataccgccacatactactgtctctacg
gctacacttactggggccaaggactctgggtcactgtctctgca

Amino acid sequence:

10 MGRLTSSFLLIVPAYVLSQITLKESGPGILQPSQTLSTCSFSGFSLTTYGIGVGWIR
QPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNNQVLLKIANVDTADTAT
YYCLYGYTYWGQGLTVTSA

63. UCHL-1 VL

Nucleotide sequence:

atgaattgacctgtaggctgttggtgctgatgttctggattcctgcttccatcagtgatgttgatgacccaaactccactctccctgc
ctgtcagctctggagatcaggccctccatctcttcgagatctagtccagagcctctttacagtaatggaacacattttacattggtacct
gcagaagccaggccagctcctcaaaactcctgatctacaaactttccaaaccgattttctgggggtcccagacaggttcagtggtcagtg
20 atcaggagacagattcacactcaagatcagcagagtgaggctgaggatctgggagttatttctgctctcaagtacacatgttccg
tggacgttcggtggaggcaccagctggaatcaaa

Amino acid sequence:

25 MKLPVRLLVLMFWIPASISDVVMTQTPLSLPVS LGDQASISCRSSQSLLYSNGNTYL
HWYLQKPGQSPKLLIYKLSNRFSGVDPDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
QSTHVPWTFGGGTKLEIK

64. UCHL-1 scFv

Nucleotide sequence:

gttgtaagcttgccgcatgaagtgcctgtaggctgttggtgctgatgttctggattcctgcttccatcagtgatgttgatgaccc
30 aaactccactctccctgcctgtcagctctggagatcaggccctccatctctgcagatctagtccagagcctctttacagtaatggaac
acctatttaccattgtacctgcagaagccaggccagctcctcaaaactcctgatctacaaactttccaaaccgattttctgggggtcccaga
caggttcagtggtcagtgatcaggagacagattcacactcaagatcagcagagtgaggctgaggatctgggagttatttctgctc
tcaaagtacacatgttccgtggacgttcggtggaggcaccagctggaatcaagatggcgggtggctcggcggtggtggtgatct
ggaggaggtgggagctctcagattactctgaagagcttgccctgggattcttcagccctcccagaccctcagctgactgttctt
35 tctctgggttttactgaccattatggtataggagtaggttgattcgtcagcctccagggaagggtctggagtggtgacacacat
tgggtggaatgataataagtactataacacagccctgaggagccggctcacaatcctcaagattcctccaacaaccaagtactcct
caagatgccaatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaagggactctggtca
ctgtctctgctgatca

40 Amino acid sequence:

MKLPVRLLVLMFWIPASISDVVMTQTPLSLPVS LGDQASISCRSSQSLLYSNGNTYL
HWYLQKPGQSPKLLIYKLSNRFSGVDPDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
QSTHVPWTFGGGTKLEIKDGGGSGGGGSGGGGSSQITLKESGPGILQPSQTLSTCS
FSGFSLTTYGIGVGWIRQPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNN
45 QVLLKIANVDTADTATYYCLYGYTYWGQGLTVTSAD

65. UCHL-1 VH I11SL12S

Nucleotide sequence:

50 gggagctctcagattactctgaaagagcttgccctgggactcttcagccctcccagaccctcagctgactgttcttctctgggtt
tcactgaccacttatggtataggagtaggttgattcgtcagcctccagggaagggtctggagtggtgacacacatttggtggaat

WO 2005/017148

PCT/US2003/041600

gataataagtaactataacacagccctgaggagccggctcacaatctccaaggattcctccaacaaccaagtactcctcaagatcgc
caatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaaggactctggtcactgtctctgct
gatca

5 Amino acid sequence:
(GSS)QITLKESGPGSSQPSQTLSTCSFSGFSLTTYGIGVGWIRQPPGKGLEWLTHIW
WNDNKYYNTALRSRLTISKDSSNNQVLLKIANVDTADTATYYCLYGYTYWGQGT
LVTVSAD

10

66. UCHL-1 scFv VH L11S

Nucleotide sequence:

gttgtaagcttcccgcctgaagttgcctgttaggctgttggtgctgatgttctggattcctgctccatcagtgatgttgatgaccc
aaactccactctccctgcctgtcagctctggagatcaggcctccatctctgcagatctagtcagagcctctttacagtaaggaac
15 acctattacattggtacctgcagaagccaggccagctctccaaactcctgatctacaaactttccaaccgattttctggggtcccaga
cagggtcagtggtgagtcagggacagatttcacactcaagatcagcagagtgaggctgaggatctgggagtttattctgctc
tcaaagtacacatgttccgtggacgttcggtggaggccaccaagctggaaatcaaagatggcgggtggctcgggcgggtggtgatct
ggaggaggtgggagctctcagattactctgaaagagcttgccctgggagctccagccctcccagaccctcagctgactgttc
ttctctgggtttcactgaccacttatggtataggagtaggttggttcgctcagcctccagggaagggtctggagtggctgacacac
20 atttggtggaatgataataagtaactataacacagccctgaggagccggctcacaatctccaaggattcctccaacaaccaagtactc
ctcaagatcgccaatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaagggactctggtc
actgtctctgctgatca

Amino acid sequence:

25 MKLPVRLLVLMFWIPASISDVVMTQTPLSLPVS LGDQASISCRSSQSLLYSNGNTYL
HWYLQKPGQSPKLLIYKLSNRFSGVSPDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
QSTHVPWTFGGGTKLEIKDGGGSGGGGSGGGGSSQITLKESGPGSSQPSQTLSTC
SFSGFSLTTYGIGVGWIRQPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNN
QVLLKIANVDTADTATYYCLYGYTYWGQGT LVTVSAD

30

67. UCHL-1 scFv (SSS-S)H WCH2 WCH3

Nucleotide sequence:

gttgtaagcttcccgcctgaagttgcctgttaggctgttggtgctgatgttctggattcctgctccatcagtgatgttgatgaccc
35 aaactccactctccctgcctgtcagctctggagatcaggcctccatctctgcagatctagtcagagcctctttacagtaaggaac
acctattacattggtacctgcagaagccaggccagctctccaaactcctgatctacaaactttccaaccgattttctggggtcccaga
cagggtcagtggtgagtcagggacagatttcacactcaagatcagcagagtgaggctgaggatctgggagtttattctgctc
tcaaagtacacatgttccgtggacgttcggtggaggccaccaagctggaaatcaaagatggcgggtggctcgggcgggtggtgatct
ggaggaggtgggagctctcagattactctgaaagagcttgccctgggagctctgcagccctcccagaccctcagctgactgttctt
40 tctctgggtttcactgaccacttatggtataggagtaggttggttcgctcagcctccagggaagggtctggagtggctgacacacat
ttggtggaatgataataagtaactataacacagccctgaggagccggctcacaatctccaaggattcctccaacaaccaagtactcct
caagatcgccaatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaagggactctggtca
ctgtctctgctgatcaggagcccaatctctgacaaaactcacacatcccaccgtcctcagcacctgaactcctgggtggaccgt
cagttctctcttcccccaaaacccaaggacaccctcatgatctccggaccctgaggtcacatgcgtgggtgggtggacgtgagc
45 cacgaagaccctgaggtcaagttcaactgtgactggacggcgtggaggtgcataatgccagacaaagccgcgggaggagga
gtacaacagcacgtaccgtgtggtcagcgtcctaccgtcctgcaccagactggctgaatggcaaggagtacaagtgcaaggtc
tccaacaaagccctcccagccccatcgagaaaacctctcaaagccaaaggcagccccgagaaccacaggtgtacacct
gccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgctgctcaaaggctctatccaagcgacatcgccgtg
gagtgaggagagcaatgggcagccggagacaactacaagaccacgcctcccgctggtgactccgacggtccttctctctac
50 agcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctcctgatgatgaggtctgcacaaccact
acacgcagaagagcctctccctgtctccgggtaaatgatctaga

WO 2005/017148

PCT/US2003/041600

Amino acid sequence:

MKLPVRLLVLMFWIPASISDVVMTQTPLSLPVSLGDQASISCRSSQSLLYSNGNTYL
HWYLYQKPGQSPKLLIYKLSNRFSGVSPDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
5 QSTHVPWTFGGGTKLEIKDGGGSGGGGSGGGGSSQITLKESGPGILQPSQTLSTLCS
FSGFSLTTYGIGVGWIRQPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNN
QVLLKIANVDTADTATYYCLYGYTYWGQGLTVTVSADQEPKSSDKTHTSPSSAP
ELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNA
KTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQ
10 PREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPPVL
DSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

68. UCHL-1 scFv VHL11S (SSS-S)H WCH2 WCH3

Nucleotide sequence:

gttgtaagcttcccgcctgaagtgccctgtaggctgttggtgctgatgttctggattcctgctccatcagtgatgttgatgaccc
aaactccactctccctgctcagtcctggagatcaggcctccatctctgcagatctagtcagagcctctttacagtaaatgaaac
acattattacattggtacctgcagaagccaggcagctcctcaaaactcctgacatcacaactttcaaccgattttctggggtccaga
cagggtcagtggtgagtgatcaggacagatttcacactcaagatcagcagagtgagggtgaggtatctgggagttatttctgctc
20 tcaaagtacacatgttccgtggacgttcggtggagggcaccagctggaatcaaagatggcgggtggtcggcggtggtggtgatc
ggaggaggtgggagctctcagattactctgaaagagctctggcctgggagctccagccctccagaccctcagctcactgttct
ttctctgggttttctgaccacttatggtataggagtaggttggtcgtcagcctccagggaagggtctggagtggtgacacac
atttggtggaatgataataagtactataacacagccctgaggagccggctcacaatctcaaggattcctccaacaaccaagtac
ctcaagatcgccaatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaagggactctggtc
25 actgtctctgctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtcctcagcacctgaactcctgggtggaccg
tcagtcttctcttcccccaaaaaccaaggacaccctcatgatctccggaccctgagggtacatgctggtggtggtgacgtgag
ccacgaagaccctgagggtcaagttcaactgtgtgacgtggagcggctggaggtgcataatgccagacaaagccgcgggaggagc
agtacaacagcagctaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggagtacaagtgaaggt
ctccaacaaagccctccagccccatcgagaaaacatctccaaagcgaaggcagcccgagaaacacaggtgtacaccc
30 tgcctccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgctcaaaggcttctatccaagcagacatcgccgt
ggagtgaggagcaatgggcagccggagacaactacaagaccagcctccctgctggtgactccgacggctccttctctctta
cagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctccgtgatgcatgaggtctgcacaacca
ctacacgcagaagacgtctcctgtctccgggtaaatgatctagaa

Amino acid sequence:

MKLPVRLLVLMFWIPASISDVVMTQTPLSLPVSLGDQASISCRSSQSLLYSNGNTYL
HWYLYQKPGQSPKLLIYKLSNRFSGVSPDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
QSTHVPWTFGGGTKLEIKDGGGSGGGGSGGGGSSQITLKESGPGSSQPSQTLSTLCS
SFSGFSLTTYGIGVGWIRQPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNN
40 QVLLKIANVDTADTATYYCLYGYTYWGQGLTVTVSADQEPKSSDKTHTSPSSAP
ELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNA
KTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQ
PREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPPVL
DSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

45

69. 5B9 VH L11S

Nucleotide sequence:

gggagctctcaggtgcagctgaagcagtcaggacctggctcagtcagtcctcagagacctgtccatcacctgcacagtctctg
gtttctattaactacatgctgtacactgggttcgacgtctcaggaaagggtctggagtggtgggagtgatattggagtggtg
50 aatcacagactataatgcagcttcatatccagactgagcatcaccaaggacattccaagagccaagtttcttaaaatgaacagtc

WO 2005/017148

PCT/US2003/041600

tgcaacctaatgacacagccatttactgtgccagaaatgggggtgataactacccttattactatgctatggactactgggggtcaa
ggaacctcagtcaccgtctcctcag

Amino acid sequence:

5 (GSS)QVQLKQSGPGSVQSSQSLSTCTVSGFSLTTYAVHWVRQSPGKGLEWLGV
WSGGITDYNAAFISRLSITKDDSKSQVFFKMNSLQPNDAIYYCARNGGDNYPPY
YAMDYWGQGTSTVTVSS

10 73. 5B9 VH L11S scFv

Nucleotide sequence:

aagcttgcgcccatgaggttctctgctcagcttctgggggtgcttctgctctggatccctggatccactgcagatattgtgatgacgca
ggctgcattctccaatccagtcactcttgaacatcagcttccatctcctgcaggtctagtaagagctcctacatagtaatggcatca
cttatttatttggtatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaacctggcctcaggagtcacagaca
15 gggtcagtagcagtggtcaggaactgatttcacactgagaatcagcagagtgagggtgaggatgtgggtgtttactactgtgctc
aaaatctagaacttccgctcagcttctgggtgctgggaccaagctggagctgaaacgggggtggcgggtggctcgggcgggtgggt
cgggtggcggcgggagctctcaggtgcagctgaagcagtcaggacctggctcagtcagtcctcacagagcctgtccatcacct
gcacagtctctggttctcattaactacctatgctgtacactgggttcgccagctcctcaggaaagggtctggagtggctgggagtgat
atggagtgggtgaatcacagactataatgcagcttccatccagactgagcatcaccaaggacgattccaagagccaagtttctt
20 aaaatgaacagcttgcacctaataacacagccatttactgtgccagaaatgggggtgataactacccttattactatgctatgga
ctactggggtaaggaacctcagtcaccgtctcctcag

Amino acid sequence:

MRFSAQLLGLLVLPWIPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLLSHNGITY
25 LYWYLQKPGQSPQLLIYQMSNLSAGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGSGGGGSGGGGSSQVQLKQSGPGSVQSSQSLSI
TCTVSGFSLTTYAVHWVRQSPGKGLEWLGVWSGGITDYNAAFISRLSITKDDSKS
QVFFKMNSLQPNDAIYYCARNGGDNYPPYYAMDYWGQGTSTVTVSS

30

70. 5B9 scFv VHL11S (SSS-S)H WCH2 WCH3

Nucleotide sequence:

aagcttgcgcccatgaggttctctgctcagcttctgggggtgcttctgctctggatccctggatccactgcagatattgtgatgacgca
ggctgcattctccaatccagtcactcttgaacatcagcttccatctcctgcaggtctagtaagagctcctacatagtaatggcatca
35 cttatttatttggtatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaacctggcctcaggagtcacagaca
gggtcagtagcagtggtcaggaactgatttcacactgagaatcagcagagtgagggtgaggatgtgggtgtttactactgtgctc
aaaatctagaacttccgctcagcttctgggtgctgggaccaagctggagctgaaacgggggtggcgggtggctcgggcgggtgggt
cgggtggcggcgggagctctcaggtgcagctgaagcagtcaggacctggctcagtcagtcctcacagagcctgtccatcacct
gcacagtctctggttctcattaactacctatgctgtacactgggttcgccagctcctcaggaaagggtctggagtggctgggagtgat
40 atggagtgggtgaatcacagactataatgcagcttccatccagactgagcatcaccaaggacgattccaagagccaagtttctt
aaaatgaacagcttgcacctaataacacagccatttactgtgccagaaatgggggtgataactacccttattactatgctatgga
ctactggggtaaggaacctcagtcaccgtctcctctgacaggagcccaatctctgacaaaactcacatccccaccgtctc
agcactgaactcctgggtggaccgtcagcttctcttcccccaaaacccaaggacacctcatgatctccggacctgagg
tcacatgcgtgggtggagctgagccacgaagacctgaggtcaagtcaactggtacgtggacggcgtggaggtgcataatgc
45 caagacaaagccgggaggagcagtagcaacagcagctaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctga
atggcaaggagtacaagtgaaggtctccaacaaagccctccagccccatcgagaaaaccatctccaagccaaggagcag
ccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagctgacctgctgggtcaaa
ggcttctatccaagcagatcgcctggagtgggagagcaatgggcagcgggagaaactacaagaccacgctccctgct
ggactccgagggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcagggaacgtcttctatgctcc
50 gtgatgcatgaggctctgcacaaccactacacgcagaagacgtctcctctgctccgggtaaatgatctagag

WO 2005/017148

PCT/US2003/041600

Amino acid sequence:

MRFSAQLLGLLVLPWIPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHNSGITY
LYWYLQKPGQSPQLLIYQMSNLAGVPDFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGGSGGGSSQVQLKQSGPGSVQSSQSLSI
5 TCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSGGITDYNAAFISRLSITKDDSKS
QVFFKMNSLQPNDAIYYCARNGGDNYPIYYAMDYWGQGTSTVTVSSDQEPKSS
DKTHTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPPEVTCVVVDVSHEDPEVKFNW
YVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPA
PIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQP
10 ENNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLS
LSPGK

15 **76. 2H7 scFv VH L11S (SSS-S)H P238SCH2 WCH3**

Nucleotide sequence:

aagcttgcgccatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagctctccagcaatcctgtctgcatctccaggggagaaggcacaatgacttgcagggccagctcaagtgttaagtacatgcact
ggtaccagcagaagccaggtatctccccaaacctggattatgcccatccaacctggcttctggagtcctgtctgcttcagtg
20 gcagtggtctgggacctctactctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgaggtt
taaccacccacgttcggtgctgggaccaagctggagctgaagatggcggctggcggcgggtggatctggagggagtg
ggagctctcaggttatctacagcagctggggtgagtggtgagggcctggggcctcagtgagatgctctgcaaggcttctggc
tacacattaccagttacaatgcactgggtaagcagacacctagacaggcctggaatggattggagctattatccaggaaat
gggtatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
25 cagcctgacatctgaagactctgcggtctatttctgtgaagagtggtgtactatagtaacttactggtacttcgatgtctggggcac
agggaccacggtcaccgtctctctgatcaggagcccaaatctctgacaaaactcacacatcccaccgtctcagcaccgtgaact
cctggggggatcgtcagcttctctctcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtgg
tggtggacgtgagccacgaagacctgaggicaagtccaactggtacgtggacggcgtggaggtgcataatgccaagacaaagc
cgcgaggaggagcagtacaacagcacgtaccgtgtggtcagcgtctcaccgtctgcaccaggactgggtgaatggcaaggag
30 tacaagtgaaggtctccaacaaagccctccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaacc
acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgctaaaggcttctatccc
agcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgctccgtgctggactccgacg
gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctcctgatgcatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga
35

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILASPGKEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWIYAPSNLAGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
40 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYNSYWFYFDVWGTTTVTVSSDQEPKSSDK
THTSPSSAPELLGGSSVFLFPPKPKDTLMISRTPPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
45 NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
PGK

78. 2H7 scFv VH L11S (SSS-S)H WCH2 WCH3

Nucleotide sequence:

50 aagcttgcgccatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagctctccagcaatcctgtctgcatctccaggggagaaggcacaatgacttgcagggccagctcaagtgttaagtacatgcact

WO 2005/017148

PCT/US2003/041600

ggtaccagcagaagccaggatcctcccccacccctggatttatgccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtgggtctgggacctcttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtggagttt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcggtggctcggcggtggtggatctggaggaggtg
ggagctctcaggcttatctacagcagctcgggctgagtcggtgaggcctggggcctcagtgaaatgctcgaaggcttctggc
5 tacacatttaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctattatccaggaaat
ggtgatacttctacaatcagaagttcaaggccaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtgactatagtaactcttactggtacttcgatgctcggggcac
agggaccacggtcaccgtctctctgatcaggagcccaaatctctgacaaaactcacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttctctctcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtgg
10 tgggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgccaagacaaaagc
cgcgaggaggagcagtacaacagcagctaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
tacaagtgaaggtctccaacaaagccctccagccccatcgagaaaacaatctccaaagccaaggcagccccgagaacc
acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgctcaaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgctcccggtgctggactccgacg
15 gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
20 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
25 DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
PGK

30

79. 2H7 scFv VH L11S (CSS-S)H WCH2 WCH3

Nucleotide sequence:

aagcttgcgccatgatttcaagtgcagatttcaagcttctgctaatcagtgcttcagtcataattgccagaggacaaattgttctct
cccagctctcagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgttaattacatgact
35 ggtaccagcagaagccaggatcctcccccacccctggatttatgccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtgggtctgggacctcttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtggagttt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcggtggctcggcggtggtggatctggaggaggtg
ggagctctcaggcttatctacagcagctcgggctgagtcggtgaggcctggggcctcagtgaaatgctcgaaggcttctggc
tacacatttaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctattatccaggaaat
40 ggtgatacttctacaatcagaagttcaaggccaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtgactatagtaactcttactggtacttcgatgctcggggcac
agggaccacggtcaccgtctctctgatcaggagcccaaatcttctgacaaaactcacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttctctctcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtgg
tggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgccaagacaaaagc
45 cgcgaggaggagcagtacaacagcagctaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
tacaagtgaaggtctccaacaaagccctccagccccatcgagaaaacaatctccaaagccaaggcagccccgagaacc
acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgctcaaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgctcccggtgctggactccgacg
gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
50 gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga